Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—SYDNEY.—July 27th. Municipal Council. One 5,000-kVA, 5,000/33,000-V step-up transformer; supply of gas-filled lamps. Specifications from the office of the Construction Engineer, Electricity Department, Town Hall, Sydney.

Postmaster-General's Department.—Automatic c.b. telephone exchange equipment, Canberra exchange.

New South Wales Public Works Department. September 14th. Electrical equipment, machinery, &c., for bascule bridge over Cooks River at General Holmes' Drive.

September 21st. Material and apparatus for complete communication system, Barrenjack hydro-electric scheme.—*Tenders.*

MELBOURNE.—August 3rd. Electricity Commission of Victoria. Switchgear and accessories.

September 14th. 3,000-kVA transformers and spares. Particulars from the Purchasing Section of the Commission, William Street, Melbourne.

Postmaster-General's Department. August 11th. (Sched. C. 26), plugs and sleeves (switchboard). (Sched. C. 25), switchboard cords.

September 15th. Lamps lamp caps, and lamp sockets. Tender forms from High Commissioner, London.

Barking.—July 28th. Electricity and Tramways Department. One 1,000-kW and one 500-kW rotary converters, with oil-cooled transformers and synchronising panels or, alternatively, one 1,000-kW and one 500-kW motor-converters (La Cour type), with starting and synchronising panels, e.h.p. switchboard, 3-wire d.c. switchboard and traction board. (See this issue.)

Belgium.—July 22nd. Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. Supply and laying at Liége of a quantity of telephone cable, with accessories. Particulars (Cahier des Charges Special No. 3-124) for 5 fr. 30 c.

Bridgend.—July 31st. Penybont Rural District Council. Kenfig Hill electricity scheme. L.p. underground and overhead mains, transformers, switchgear, meters, and house wiring. (June 26th.)

Cardiff.—Education Committee. Electrical wiring and fittings for Council schools at Ely and Mynachdy. Specifications from the City Electrical Engineer, The Hayes, Cardiff.

Dundee.—July 17th. Electricity Department. Steam and exhaust pipes. (June 26th.)

Eccles.—July 15th. Electricity Department. 2,200-V switchboard, consisting of five feeder panels. Specification and form of tender from Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Edinburgh.—July 13th. Electricity Department. Installation of electric lighting at the public wash-house, Abbeymount, Edinburgh. Specifications from Engineer, Dewar Place.

Egypt.—CAIRO.—Inspecting Engineer in London. 3,000 metres submarine cable, underground cables, 10 tons line wire, bolts and nuts, &c.

Grimsby.—August 1st. Electricity Department. Storage battery, booster, and switchgear. (See this issue.)

Hanwell.—July 18th. Central London School District. Extension of the electric lighting installation. Specification from Mr. G. F. Morrell, clerk to the Managers, Greenford Avenue, Hanwell, W.7.

India.—SIMLA.—July 20th. Indian Stores Department. Diesel-engine alternator sets, water-cooling units, oil fuel storage tank, oil-purifier equipment, 10-ton overhead crane, switchboard, cables transformers, e.h.p. feeder cables, &c.*

July 17th. India Store Department. Porcelain insulators. (See this issue.)

Leeds.—July 15th. Corporation. Electric lighting installation at 40, Park Lane. Particulars from Mr. W. T. Lancashire city engineer, Municipal Buildings.

July 14th. Board of Guardians. Supply of "Osram" electric lamps. Specifications from Mr. J. H. Ford, clerk to Board of Guardians, Poor Law Offices, 11, South Parade.

London.—ST. PANCRAS.—September 3rd. Electricity Department. One 10,000-kW steam turbine, alternator, condensing plant, pipes, &c. (See this issue.)

BETHNAL GREEN.—July 20th. Electricity Department. L.p. cables and switchgear. (See this issue.)

Lymm.—July 13th. Urban District Council. Electrically-driven centrifugal pump. Particulars from Mr. N. Holt, clerk to the Council, Council Offices.

Manchester.—July 16th. Board of Guardians. Electrically-driven booster pumping plant at Booth Hall Infirmary. Particulars from Mr. E. Hargreaves, Union Offices.

July 20th. Electricity Department. Electric cooking ranges, and switches and cut-outs for 12 months. (July 3rd.)

July 14th. Tramways Committee. Span wire brackets for tramway poles; copper trolley wire; copper bonds. Specifications from Mr. H. Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

New Zealand.—WELLINGTON.—August 18th. Posts and Telegraph Department. Switchboard plugs.*

INVERCARGILL.—Electricity Department. 2 200 ft. .1 sq. in. 11,000-V cable; 80 ft. .3 sq. in. 3,300-V cable and spares.*

August 17th. Four 667-kVA single-phase transformers.*

MARLBOROUGH.—September 22nd Electric Power Board. Turbines, generators, and switchgear. (B.X. 1,904.)*

South Africa.—JOHANNESBURG.—August 1st. Municipal Council. Twelve a.c. power relays.*

West Ham.—July 20th. Education Committee. Wiring of eight schools. (June 26th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—SYDNEY.—City Council. Accepted:—

Double-braided weatherproof cable (£4,554).—Enfield Cable Works (Aust.) Ltd.

Service boards (£999).—G. Hudson & Sons, Ltd.

10,000-V feeder protective apparatus (£587 and £113).—Australian General Electric Co., Ltd.

5,000-V potential transformers.—Australian General Electric Co., Ltd.

A.c. consumers' meters (£15,287).—Electricity Meter Mfg. Co.

MELBOURNE.—Department of Works and Railways.

7 motors at City South Telephone Exchange, Sydney (£728).—Siemens Bros. & Co., Ltd. —*TENDERS.*

Belgium.—Belgian, Swiss, and British (Metropolitan-Vickers, Ltd.) firms submitted tenders last week to the municipal authorities of Schaerbeek, Brussels, for the supply of 112 h.p. and l.p. electricity meters. The lowest offer was that of the New Antwerp Telephone and Electrical Works Co.

Birkenhead.—Tramways Committee. Accepted:—

Electrical equipment at tramways depôt (£2,961).—British Thomson-Houston Co., Ltd.

Birmingham.—Education Committee. Accepted:—

Electric lighting installation at Billesley elementary school (£435).—R. H. Newton.

Corporation. Accepted:—

Three double-deck railless cars.—Railless, Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—

Mains (£2,885).—Johnson & Phillips, Ltd.

Switchgear (£481); switchgear and transformers (£1,605).—Ferguson, Pailin, Ltd.

Canterbury.—Town Council. Accepted —

2,300 yd. of cable (£1,897).—Western Electric Co., Ltd.

Dundee.—Corporation. Accepted:—

Electric lighting installation at 216 houses at Dudhope (£1,696).—R. Kilpatrick & Co.

Hawarden.—Rural Council. Accepted:—

Five sub-station transformers (£499).—General Electric Co., Ltd.

Switchgear (£972).—Powell Lighting Supplies Co., Ltd.

Hull.—Electricity Committee. Accepted:—

Two 7,000-kW turbo-alternators:—

	Steam Consumption (lb. per kW hr.).	Price.
Oerlikon, Ltd.	11.20	£43,042
Escher Wyss & Co.	10.72	53,176
English Electric Co., Ltd.	11.06	56,812
James Howden & Co., Ltd.	11.00	57,646
Ditto	11.00	57,661
C. A. Parsons & Co., Ltd.	11.00	57,720*
Brush Electrical Engineering Co., Ltd. (Accepted.)	10.67	**57,823**
British Thomson-Houston Co., Ltd.	11.10	57,986
Ditto	11.10	58,319
Ditto	11.10	58,834
Fraser & Chalmers	10.80	59,251
British Thomson-Houston Co., Ltd.	11.10	59,304
Metropolitan-Vickers Electrical Co., Ltd. ...	10.66	61,430
C. A. Parsons & Co., Ltd.	10.42	62,280*
Richardsons, Westgarth & Co., Ltd.	11.27	76,036

*7,500 kW.

Telephones Committee. Switchboards:—

British L. M. Ericsson Manufacturing Co., Ltd.	(Accepted.)	**£295**
Western Electric Co., Ltd.		325
Peel-Conner Telephone Works, Ltd.		299

Lamp Contracts.—The Royal Mail Steam Packet Co. has placed a contract for a 12 months' supply of gasfilled lamps and an order for a large number of metal-filament and carbon-filament lamps with the Siemens & English Electric Lamp Co., Ltd.

The Edison Swan Electric Co., Ltd., has received an order from the Great Southern Railway of Ireland for six months' supply of electric lamps.

Leeds.—Tramways Committee. Accepted:—

50 gear wheels (£444).—National Steel Foundry (1914), Ltd.

150 pinions (£139).—W. Muir & Co., Ltd.

Electricity Committee. Accepted:—

Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£7,485); Enfield Cable Works, Ltd. (£3,499); Macintosh Cable Co., Ltd. (£2,664).

Meters (£3,900).—Measurement, Ltd.

Libraries Committee. Accepted:—

Electric lighting installation, Alexander Street premises (£184).—Clake's Extension, Ltd.

London.—ST. PANCRAS.—Electricity Committee. Recommended :—

Coal for the electricity station for eight months from August 1st :—

15,400 tons Bentinck Derby main slack, ¾ to 1 in. (22s. 5d. per ton); 7,200 tons Stanton Deep nutty slack (21s. 11d. per ton).—J. H. Beattie and Co., Ltd.

GREAT WESTERN RAILWAY CO.

Six petrol-electric mobile cranes.—Ransomes & Rapier, Ltd.

Manchester.—The City Council at its meeting last week, by 77 votes to 17, rejected the recommendation of the Tramways Committee to place a £5,000 contract for tramway track work with the United States Steel Products Co. The *Manchester Guardian* states that at one time during the discussion there seemed to be a possibility of the old fiscal controversy being reintroduced but eventually the Council took the view that the tender should not be accepted, mainly because of the unemployment in this country, and because evidence was produced to the effect that the conditions of employment in the American firm did not conform with the provisions of the Fair Contracts Clause of the Standing Orders of the Manchester Corporation. By an overwhelming majority the Tramways Committee was instructed to accept the lowest English tender for this particular work.

Oldham.—Electricity Committee. Accepted:—

Transformers.—Ferranti, Ltd.

Rotherham.—Electricity Committee. Accepted:—

250-kW transformer (£217).—General Electric Co., Ltd.

Sheffield.—Tramways Committee. Accepted:—

750 tons of tramway rails (£8,250).—Steel, Peech & Tozer, Ltd.
Copper bonds (£92).—British Insulated & Helsby Cables, Ltd.
Three 500-kVA transformers (£1,233).—British Electric Transformer Co., Ltd.
Ropeway extension at Neepsend power station (£2,145).—R. White & Sons, Ltd.

Sleaford.—Urban Council. Accepted:—

Additions to station (£849).—Banks & Son.
Switchboard (£107).—Edison Swan Electric Co., Ltd.
Oil engine (£4,960).—Premier Gas Engine Co., Ltd.
Generator (£1,450).—General Electric Co., Ltd.

South Africa.—JOHANNESBURG.—Department of Posts and Telegraphs. Accepted :—

Apparatus for automatic telephone exchange, Kloof, Natal (£1,532).—Siemens Bros & Co., Ltd.

DURBAN.—Municipal Council.

5 miles .25 sq. in., 6,600-V cable (£7,539); 1¼ miles .1-in. ditto (£1,065); 1 ton bare copper wire (£90).—T. Barlow & Sons, Ltd.
10 "Falco" electric stoves and 1 bath heater, for the fire station (married quarters) (£204).—J. F. Chapman.
One 250-kVA, 3-phase transformer (£185).—Ferranti, Ltd.
1¼ miles .06 sq. in. 6,600-V cable (£1,000).—R. D. Lavery & Co., Ltd.
Watt-hour meters.—Metropolitan-Vickers Electrical Co., Ltd. (£611); Vincent & Pullar, Ltd. (£392).
Two 250-kVA single-phase transformers (£414).—Vincent & Pullar, Ltd.
One telpher hoist for ash removal at power station (£785).—R. Dempster and Son, Ltd.—*South African Power Engineer.*

Notes.

Traffic Control Device.—Experiments are being made in Berlin at night with electrically-lighted street "islands," which will afford policemen on point duty a safe stand. The light is thrown upwards from the ground on to the traffic controllers so that their signals can be seen clearly from a distance, says the *Daily Mail*. In winter the "islands" will be heated.

Electrical Exhibits at the Royal Agricultural Show.—About 50 of the stands at the Royal Agricultural Show of England, which is being held at Chester this week (July 7th to 11th), are electrically equipped, energy being supplied free of charge by the Chester Corporation, to which must be given credit for having persuaded the R.A.S.E. to agree to the wiring of stands. One and a half miles of overhead transmission is employed. The Electricity Department of the Corporation has a stand where demonstrations are being given, showing the utility of electricity in the homestead and on the farm, in numerous directions. Mr. S. E. Britton, M.I.E.E., M.I.Mech.E., city electrical engineer, informed our representative that his department was "all out" to dissipate some of the prejudiced and ill-informed ideas concerning the use of electricity in agriculture. The purposes for which electric power is used on various stands at the Royal Show are :—Refrigerating, milking and milk cooling, corn grinding and milling, conveyors, ploughing, mole draining, cultivators, winnowing, barley dressing, seed cleaning, churning and separators, thrashing machinery, water pumping, pasteurising, barn machinery, bottle washing, bacon slicing, oil refining, heating and driving linotype machinery, crop drying, lighting, heating, fans, and for general purposes. On Wednesday morning (July 8th) there was to be an Electro-Farming Conference, at which Lord Bledisloe, K.B.E., was to preside, and Sir E. John Russell, D.Sc., F.R.S., was to deliver a speech from the point of view of the agriculturist. Mr. S. E. Britton and Mr. R. Borlase Matthews were also down to speak on the practical applications of electricity to agriculture.

Fire.—On July 6th, the premises of the Brighton Supply Stores, Gloucester Road, Brighton, were badly damaged by fire and water. The shop was stocked with electrical and radio accessories.

Appointments Vacant.—Fitter-Driver (67s. 3d.), for Severalls Mental Hospital, Colchester. Lady Demonstrator (£182) for the Borough of Cheltenham electricity department. Charge Engineer for the St. Helens Corporation electricity department. Charge Engineer for the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. Meter Tester and Repairer for the Eastbourne Corporation Electricity Department. Junior Draughtsman for the Cardiff Corporation Electricity Department. Junior Electrical Testing Assistant for Salford Borough Council Electricity Department.

Transformer Oil Problems.—The American National Electric Light Association's 1925 Electrical Apparatus Committee has reported that some difficulties have been experienced through the congealing of oil in transformers that have been subjected to extremely low temperatures, and a few examples are cited in *Power*. Freezing in the pipe connection between the transformer and the conservator tank has occurred in several cases, and a remedy has been found in covering the pipes with a heavy lagging of heat insulating material which in some cases has been supplemented with a small electric heater. In one case the temperature of the transformer was noticed to rise, due apparently to the oil congealing and impeding the circulation through the radiators; after applying external heat for a short time to the lower end of the radiators, free circulation was established and the transformer temperature reduced. A case of the sludging of transformer oil is also reported; investigations indicated that the deterioration of oil varied considerably with transformers of different make, but the possible causes have not yet been determined. The causes of the deterioration of oil for use in transformers and oil circuit breakers are engaging the serious attention of several manufacturers of equipment for filtering and cleaning oil. In addition to the well-known methods, using blotter filters and centrifugal separators, other methods, involving supplementary treatment, are being tried in which certain reagents are introduced into the oil to absorb impurities, and separated out again, leaving a clean oil.

Coosa River Hydro Project. — According to *Power*, the Alabama Power Co. has filed an application with the Federal Power Commission for licence to build a hydro-electric power dam on the Coosa River 15 miles above Montgomery, Ala. It proposes to complete the scheme within three years, commencing in December next. The dam is to be 90 ft. high with an initial installation of 72,000 h.p., estimated to cost $13,500,000. It will complete about 65 miles of navigation pool created by the power dams of this company on the 116-mile non-navigable stretch of the Coosa River between Gadsden and Montgomery. The pools submerge several small low locks and dams built by the Government more than a third of a century ago to improve navigation, but which have long since been abandoned.

A Substitute for the Liquid-air Trap for Mercury Vapour.—In an interesting letter published in *Nature* of June 27th, Messrs. A. Ll. Hughes and F. E. Poindexter, of Washington University, U.S.A., refer to the disadvantages of the liquid-air trap for mercury vapour in the mercury vapour condensation pump, and state that in the course of a search for an alternative method of trapping mercury vapour, they have found that the alkali metals have an extraordinary power of absorbing mercury vapour. Their practice is to put a small piece of sodium or potassium into a trap between the diffusion pump and the apparatus to be exhausted, and to distil it, after the vacuum has been obtained, on to the sides of the trap, thus lining it with the metal for a few centimetres. Using an ionisation gauge for the vessel to be exhausted, they have found that the pressure of mercury vapour in it with a potassium-lined trap between it and the pump is certainly less than 5×10^{-9} mm. By making direct comparisons between the trapping power of a potassium-lined tube and that of the usual liquid-air trap, the same ionisation gauge measuring the pressure reduction, they have found that the potassium-lined trap is quite as satisfactory as liquid air. The residual pressures obtained in various tests seemed to depend entirely upon the vigour with which the ionisation gauge and connecting tubes were outgassed by heat treatment before the measurements were made, and not at all upon whether liquid air or metallic potassium was used to trap the mercury. In one test, in which sodium was the active metal, the pressure in the ionisation gauge beyond the trap after 25 days was within 50 per cent. of its initial value (2×10^{-7} mm.).

In a second test, they used the first appearance of mercury lines in the spectrum of helium, at less than 0.01 mm. pressure, as a criterion of the diminution of the trapping power of a potassium-lined trap for mercury vapour. The mercury lines did not appear until the eleventh week, in which time the potassium had absorbed a little more than 150 per cent. of its own weight of mercury.

Report on a Nottingham Breakdown.—A recent dislocation of the Nottingham electricity supply, involving an entire stoppage throughout one day of the tramways and the partial holding up of the supply for illuminating and general motive purposes, formed the subject of reference at a meeting of the City Council on July 6th, when Alderman E. Huntsman, chairman of the Electricity Committee, explained that investigations as to the firing of the cables at the St. Ann's Well Road generating station, which was the cause of the mischief showed that the outbreak did not originate through electrical

defects. It had been mistakenly conjectured that it was due to the overloading of some of the cables from the station into the general system. That erroneous idea was, however, discounted by the fact that a minute examination of the copper conductor disclosed no traces of fusion or melting. The fire happened early in the morning, when the load was well below the normal. An official sent down by the Board of Trade and a representative of Messrs. Callender's Cable and Construction Co., Ltd., who were doing work for the Corporation in connection with the extension of the present system, had participated in making independent investigations, with the result that they coincided in the view that the cause of the fire was not electrical. The cables were in a subway, and at this time of the year, and with a certain temperature in the cables themselves, everything was abnormally dry. The only possible explanation of the affair was that possibly a match or a cigarette end thrown through a ventilating aperture in the subway fell on one of the cables. There was a tendency to draught in the subway, and when one cable burnt, the others were soon alight. That, Alderman Huntsman concluded, was the only possible explanation of the whole trouble.

Cheap Electricity Promised. — Speaking at Bradford recently, Lieutenant-Colonel Moore-Brabazon, Parliamentary Secretary to the Ministry of Transport, said he hoped that if a Bill to be introduced in the autumn was passed this country would have electricity cheaper than anywhere else. With its coal reserve England was one of the best countries in the world for the cheap generation of electricity, which meant so much to an industrial nation.—*The Times.*

A Tasmanian Appointment.—A newspaper report just to hand, and dated May 16th, states that 12 applications were received for the position of general manager and chief engineer of the Tasmanian Hydro-Electric Department. Eleven came from within Tasmania and the mainland, and one from South Africa. The position carries a salary of £1,250 a year, with an annual increase of £50, to a maximum of £1,500. The Cabinet was to consider the applications.

Transport of a Large Stator.—A new M.V. stator for the 25,000-kW generator at Lister Drive power station, Liverpool, has recently been delivered. Weighing 91 tons, this was sent by road from Manchester, being hauled on a specially built bogie weighing 16 tons, by three large road tractors. Thus the total load was 107 tons. The journey of 40 miles occupied fifteen hours' travelling time.

The Contractor and Electric Farming.—In his speech at this year's annual dinner of the Electrical Contractors' Association, Mr. W. Riggs, the president, made reference to the opportunities which would be presented to contractors when rural electrification was seriously undertaken in this country.

In preparing for this the contractor must bear in mind that the class of work which he will have to undertake has many aspects which are absent from other installation work, but should be given the fullest consideration to ensure complete satisfaction with electrical methods. Some of these points are dealt with in an article which recently appeared in *The Electragist* (the United States contractor-dealers' organ) and they seem to be worthy of reproduction. The general remoteness of farms from any contractor's premises and from a fire station makes it imperative that installations shall be as free as it is humanly possible to make them from interruptions and fire risks. This should always be the aim, of course, but it may be necessary in the case of rural installations to take extraordinary precautions. In barns there is always a danger of wires being gnawed by rats and our American contemporary suggests the use of an all-metal system of the flexible or conduit types. Much of the outside work on the farm will be done by a single portable motor which will have a wide range to cover. Efforts should therefore be made to provide a large number of plug-in points to obviate the use of great lengths of cable. The rearrangement of farm machinery may be suggested, as the bringing of as much of it as possible into a small area will save a great deal of wiring.

It is worth the while of any contractor to obtain diagrams of several typical farm buildings in his area and if he is not already thoroughly acquainted with working conditions on farms, to learn what they are. So seemingly unimportant a matter as the position of a switch with reference to a stable door, the stalls and the runway, may be a matter of considerable importance to the farmer. Farm wiring systems should be planned with the thought in mind that, eventually, power will be obtained from a rural distribution line even where the establishment has its own small power plant. It should also be remembered that the use of electricity for some farm processes will almost inevitably lead to its use for other purposes and preparation should be made for such extensions to facilitate them when they are called for. It is also fair to assume that many of the heavier electrically-driven machines, such as thrashers, hay balers, &c., will be taken from farm to farm. Provision should be made for attaching them most conveniently and efficiently.

After pointing out the benefits which will accrue from the electrification of farms, the writer says that the contractor will play an important part in furthering the business. "More than this, he will do much to promote or retard it by the kind of work he does, which will involve careful planning the best of workmanship, and the use of quality materials."

Staveley Coal Co.'s New Plant.—The Staveley Coal and Iron Company has installed what is said to be the largest gas engine in the country for the purpose of increasing its output of electricity, and this was recently set in motion. The new engine is operated by waste gas from the blast furnaces, and generates sufficient energy to supply the district within a 30-mile radius. The company owns about 10,000 houses, most of which are supplied with electricity on the weekly payment system.

H.p. Pirelli Cable for New York.—We learn from *Power* that a new underground 132,000-V cable of the Pirelli type, the patent rights on which were recently secured by the American G.E.C. from the Italian electrical firm, is about to be installed in the Bronx for the New York Edison Co. This new line, costing about $2,500,000, will be used to link up the generating stations of the New York Edison Co. and its allied companies, which is calculated to render available 120,000 h.p. additional for this section. The new cable, which will be only 3 in. in diameter, will be placed in concrete ducts four or five feet deep. It is said that it will be the highest-pressure cable ever installed in America and probably in the world.

Institution Notes.

Institution of Electrical Engineers.—CONVERSAZIONE.—On Thursday last week the annual conversazione of the Institution was held at the Natural History Museum, South Kensington, London, the guests being received by the President, Mr. W. B. Woodhouse, and Mrs. Woodhouse, with members of the Council. Music was provided by the string band of the Royal Engineers under Lieut. Neville Flux, F.R.A.M., and a concert was given by the Gresham Singers and other artistes. There was a large attendance, though not quite so many were present as there were last year, fewer members from provincial Centres being met with on this occasion. The arrangements were as usual admirably organised, and the function was very enjoyable. The central hall was lighted with powerful gasfilled lamps, and although these were at a considerable height the fact that they were wholly unscreened was unpleasantly noticeable; doubtless the Institution was in no way responsible for this lapse from good practice, but the lamps must have been fixed by someone professing to be an electrician, and the attention of the Trustees might well be drawn to the crudity of the method adopted. In the West Wing very appropriate fittings have been installed.

Association of Mining Electrical Engineers.—It is necessary to correct some of the statements contained in the report which appeared under the above heading in our issue of June 26th. The meeting referred to as the summer meeting was the annual general meeting of the Association, held in Cardiff at the invitation of the South Wales branch. It should also be noted that Mr. Theodore Stretton is the new president of the Association, who with the vice-presidents, Messrs. D. Martin, O.B.E., and G. M. Harvey, and the hon. treasurer, Mr. Alex. Anderson, was elected at the meeting. The meeting at which Major David's paper was discussed was a joint meeting of the Association of Mining Electrical Engineers, the Western Centre of the I.E.E., and the South Wales Institute of Engineers. This meeting was presided over by Mr. Spence Thomas, president of the South Wales Institute of Engineers, who was supported by Mr. Theodore Stretton and by Mr. A. C. MacWhirter, past chairman of the Western Centre of the I.E.E. The dinner held at the Park Hotel was the Association's annual dinner.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements).

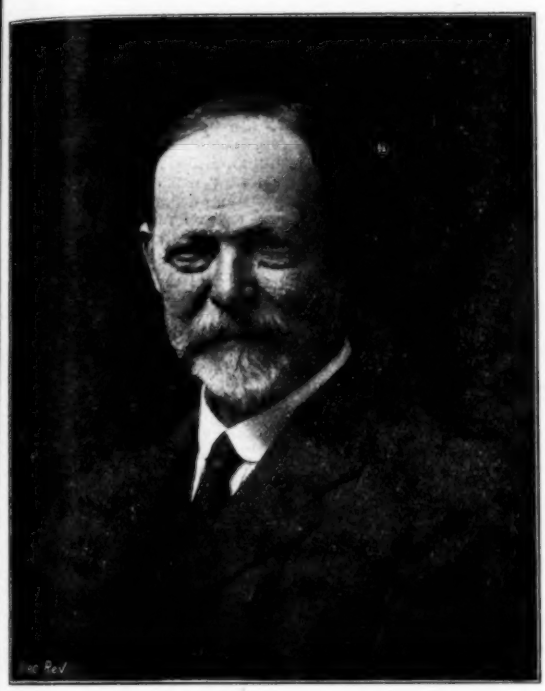
On the motion of Alderman Aspinall, a resolution of Bolton Tramways Committee raising the salaries of the tramway manager and two of his staff by two years' increments instead of one, was defeated at a recent Town Council meeting.

Mr. HUGH CASEY, on his retirement on pension from the chief collectorship of the Londonderry Corporation Electricity Department, has been presented with a wallet of Treasury notes.

The honorary degree of Doctor of Laws has been conferred upon Mr. SAMUEL INSULL, president of the Commonwealth Edison Co., of Chicago, by the North-West University. The *Electrical World* records the following tribute paid to him by the Dean:—"Pioneer in public utility development, president and moving spirit of the Chicago Civic Opera Company, trustee of St. Luke's Hospital and active worker in its behalf, chairman of the Illinois State Council of Defence, patron of music, humanitarian and public-spirited citizen, a leader in civic and industrial progress."

Messrs. Vickers, Ltd., Naval Construction Works, Barrow, announce that Mr. G. W. JACKSON, Mr. W. E. PRICHARD, and Mr. J. CALLANDER, have been appointed special directors of the company. Mr. Jackson and Mr. Pritchard are at the head of the commercial department of the Barrow establishment, and Mr. Callander was recently appointed general manager of the engineering departments.

The president of the International Congress of Radiology which was held in London last week is Mr. CHARLES THURSTON HOLLAND, C.L., Ch.M. Mr. Holland, whose portrait accompanies this note, is one of the leading British radiologists, and



Mr. C. Thurston Holland, D.L., Ch.M.
President of the International Congress of Radiology.

he was one of the pioneers of X-ray work, having commenced the study and practice of the subject in 1896. He was an original member of the Röntgen Society, of which he has twice been president.

Among the distinguished foreign delegates to the Congress was M. LE DUC DE BROGLIE, who has for a number of years taken a leading part in physical research in France. He is well known in this country having been connected, as French representative, with the Admiralty Inventions Board during the war. He has read papers before the British Association and other British scientific bodies, is an honorary member of the Royal Institution of Great Britain, and a doctor, *honoris causâ*, of the Oxford and Leeds Universities. The Duc de Broglie delivered the eighth Silvanus Thompson Memorial Lecture on July 1st.

At the Helsby offices of the British Insulated & Helsby Cables, Ltd., last week, Mr. H. HARDING, a member of the technical staff was presented with a leather suit-case, subscribed for by his colleagues on the technical staff. He is taking up a position on the Prescot works contract staff. The presentation was made by Mr. W. J. Britland.

The daily Press is informed that the head of the Wireless Research Laboratories of the Royal Air Force, Dr. JAMES ROBINSON, has tendered his resignation to the Air Ministry, in order to take up the post of Director of Research to the group of periodicals produced by the Radio Press, Ltd. Dr. Robinson received a large sum for his war inventions from the Royal Commission on Awards to Inventors, his radio navigating apparatus for aeroplanes being used in the Royal Air Force.

Mr. Z. H. KINGDON, who has been superintending electrical engineer at Devonport since 1908, and was recently awarded the O.B.E., is about to retire. He will be succeeded by Mr. H. F. HUNT, superintending electrical engineer at Rosyth Dockyard. Since Mr. Kingdon took up his post at Devonport Dockyard the electrical staff has increased from 450 to 1,300.

At a gathering of all grades of the electrical department at Devonport Dockyard on Friday last, a presentation was made to Mr. KINGDON, in the form of a grandfather clock. Mr. E. E. Benham, senior electrical engineer, expressed the regret of all at parting with Mr. Kingdon, who was appointed 17 years ago and had set before them a very high standard of personal duty. Mr. H. Simpson, representing the skilled labourers, spoke of Mr. Kingdon's ready sympathy with them at all times. Tributes to the retiring chief were also paid by Messrs. W. J. Wooton, who presided; W. McClelland, Director of Electrical Engineering, on behalf of the Admiralty staffs, and several other colleagues and Mr. Kingdon, in reply, said that their aim as fellow workers was to keep the Navy efficient, and the position the department now held was due more to those who helped him than to himself. He then introduced to the gathering his successor, Mr. Hunt. A gold anchor brooch and a bouquet were presented to Miss Kingdon.

With reference to the appointments of Messrs. H. C. LAMB and H. A. RATCLIFFE as chief engineer and manager, and deputy chief engineer at Manchester, the Council, in confirming the recommendations of the Establishment Committee, which were given on p. 27 of our last issue, altered the salaries to £2,000 and £1,150 respectively. The Electricity Committee has placed on record its high appreciation of the services of Mr. S. L. PEARCE, extended over a period of 24 years, and while regretting its loss "is not unmindful of the high honour conferred upon the Manchester Corporation" by the Government in asking Mr. Pearce to become an Electricity Commissioner. An Australian newspaper recently to hand quotes from a letter written by Mr. Pearce expressing regret that the Sydney City Council has decided to disregard his recommendation in respect of the agreement with the Railway Commissioners and the new power house and hoping that some means may be found of averting what he would regard "as a disaster both for the City and the State."

Mr. JOHN RICHARDSON has been appointed working electrical engineer under the electricity scheme of the Hawarden Rural District Council. There were 290 applicants from whom a short list of three was selected to appear before the Council.

Mr. E. C. WANSBROUGH having relinquished the secretaryship of the Electrical Accessories Manufacturers' Association, all correspondence should for the present be addressed to Mr. J. N. Stephens, the chairman of the Association, at 39, St. James's Street, S.W.1.

Mr. R. S. HERBERT, assistant mains engineer, Oldham Corporation electricity department, has resigned to accept an appointment in Singapore.

When the Birmingham Tramways Department's Social Athletic and Thrift Society celebrated its coming-of-age at the Town Hall on July 1st, Mr. ALFRED BAKER, the manager of the department, who has been president of the Society since its formation 21 years ago, was presented with a model omnibus, oxidised finish and having silver panels for windows. The upper half of the model takes the form of a cigarette box.

The Oldham Town Council has been recommended by the Tramways Committee to grant the following increases of salary:—Mr. J. F. RICHARDS, works superintendent, from £300 per annum, plus £85 7s. 4d. bonus, to £350, plus the same bonus; Mr. J. S. SMITH chief cashier, from £221 per annum, plus £71 18s. 8d. bonus, to £271, with the same bonus; Mr. M. MULLIN, traffic superintendent, from £276 per annum, plus £38 bonus, to £326 per annum, plus the same bonus.

The Staffing Sub-Committee of the Crewe Town Council recommended that the salary of Mr. DENTON, electrical engineer, be in accordance with the scale fixed by the Association, less 5 per cent. reduction. This would advance him from £660 per annum, less 5 per cent., to £725 per annum, less 5 per cent. The General Purposes Committee has, however, by the chairman's casting vote, referred the matter back for further consideration.

Worcester Corporation Electricity Committee recommends that the salary of Mr. SHAW, the chief electrical engineer, be increased to £1,000.

Dr. T. F. WALL has been appointed head of the electrical engineering department in the University of Sheffield.

On Tuesday afternoon, in the Lord Mayor's Parlour, at the Town Hall, Manchester, a public presentation was made to Mr. S. L. PEARCE, on the occasion of his vacating the various offices which he has held apart from his Manchester position.

Mr. W. CHAMBERLAIN, late tramway manager and engineer at Oldham, who has left for Leeds, has been presented by the chief officials of the Oldham Corporation with a piece of silver plate.

We are asked to state that Mr. A. G. M. MICHELL, of Michell Bearings, Ltd., Crankless Engines, Ltd., and Crankless (European Patents) Proprietary, Ltd., has recently arrived from Australia, and has opened an office at 20, Grosvenor Gardens, London, S.W.1.

In our "Lighting and Power" Note under Dover last week we inadvertently gave the name of the engineer as Mr. H. D. Munro. We regret the error. Mr. R. C. HARPUR, A.M.I.E.E., is borough electrical engineer at Dover.

Obituary.—MR. E. W. ROBINSON.—We regret to record the death which occurred in hospital of enteric fever, on June 24th, of Mr. Erik Watney Robinson, of Kingston-on-Thames. Mr. Robinson, who was the youngest son of the late Mr. Mark Robinson (Willans & Robinson, Ltd.), was 37 years of age. He was an electrical engineer with a London firm. At the outbreak of war he enlisted in the Grenadier Guards and later he was given a commission in the Royal Worcester Regiment.

MR. W. FINNERTY.—*The Times* records the death, which occurred on July 3rd, at Cherbourg, France, of Mr. William Finnerty, of Bedford Park, "for many years with the International General Electric Co. of New York."

Wills.—The late MR. ARTHUR JACOB left £2,201 net and £4,465 gross personalty.

Mr. W. SEYMOUR, electrical engineer (W. Seymour & Co. London, S.W.), left £2,299 net and £5,620 gross personalty.

New Companies Registered.

New Wilson Electrical Manufacturing Co., Ltd. (206,993).—Private company. Registered July 1st. Capital, £500 in 400 12½ per cent. cumulative preference shares of £1 each and 2,000 ordinary shares of 1s. each. Objects: To acquire from C. F. Adolph and Winifred Bryce-Wilson letters patent and provisional protections Nos. 8,574/25 and 13,510/25 for valveless amplifiers for crystal wireless sets and any secret or other information, process or formula of the said C. F. Adolph, &c. The directors are:—Brig.-General O. K. Chance (permanent director and chairman), Rothmans, Great Baddow, Essex (sales manager to British Cyanides Co., Ltd.); Mrs. Winifred Bryce-Wilson, 41, Denbigh Street, Victoria, S.W.; M. Stephany, 68, Melrose Avenue, Cricklewood, N.W.2. Qualification, £1. Solicitors: Feacock & Goddard, 3, South Square, Gray's Inn, W.C.1. Registered office: 65/6, Basinghall Street, E.C.2.

Lincoln Wireless Co., Ltd. (207,015).—Private company. Registered July 2nd. Capital, £1,200 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless telegraphic and telephonic apparatus, valves, instruments, equipment, accessories, electrical, X-ray, magnetic and radioactive instruments and apparatus, &c. The directors are:—R. H. Harrison, 79, Newland Street West, Lincoln, wireless engineer; O. H. Waterton, 19, Tennyson Street, Lincoln, wireless engineer; H. Waterton, 19, Tennyson Street, Lincoln, tailor. Qualification, 25 shares. Remuneration as fixed by the company. Secretary: R. H. Harrison. Solicitors: Langley, Stevens & Phillips, 34, Silver Street, Lincoln. Registered office: 30, Newland Street West, Lincoln.

O. S. Choppin & Co., Ltd. (207,018).—Private company. Registered July 2nd. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical engineers carried on by O. S. Choppin & Co., at 41, Lower Belgrave Street, S.W.1. The first directors are: O. S. Choppin, Oakwood, Herne Bay Road, Whitstable, electrical engineer; M. C. Creswell, 45, Hillcourt Road, East Dulwich, S.E.22, electrical engineer. O. S. Choppin is permanent governing director subject to holding 500 shares. Solicitors: Doyle, Devonshire & Co., 14, Bedford Row, W.C. Registered office: 41, Lower Belgrave Street, S.W.1.

Official Returns of Electrical Companies.

Henry Joseph & Co., Ltd.—R. G. Sidford, of 36, Southampton Street, Strand, W.C., was appointed receiver on June 18th, 1925, under powers contained in debentures dated May 16th, 1924.

Electrical Insulating Composition Co., Ltd.—J. Lucas, of 26, Birley Street, Blackpool, incorporated accountant, was appointed receiver on June 19th, 1925, under powers contained in debenture dated September 10th, 1924.

E. S. Company, Ltd.—B. A. Smith, F.C.A., of 11, Queen Victoria Street, was appointed receiver and manager on June 26th, 1925, under powers contained in first mortgage debenture dated November 17th, 1920.

Dawlish Electric Light and Power Co., Ltd.—Satisfaction to the further extent of £500 (balance) on May 25th, 1925, of mortgage debenture dated September 24th, 1920, securing £2,000.

Néon Lights (1923), Ltd.—Satisfaction in full on June 3rd, 1925, of debenture dated October 30th, 1924, securing £1,500.

Debenture dated June 17th, 1925, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Major T. G. Pollock, 2, South Parade, Southsea.

Sudan Light and Power Co., Ltd.—A trust deed dated June 20th, 1925, to secure £400,000 debenture stock and all sums paid by the guarantors thereof, charged on the benefit of two agreements dated January 10th, 1925, with Lt.-Col. Schuster, C.B.E., M.C., and moneys payable thereunder and the company's undertaking and property, present and future, including uncalled capital, has been registered. The trustees are: Debenture Corporation, 4, Walbrook, E.C. The guarantors are: Commissioners of H.M. Treasury.

Orling's Telegraph Instruments Syndicate, Ltd.—Issue on June 17th, 1925, of £25 debentures, part of a series already registered.

W. R. Harding & Co., Ltd.—Debenture dated June 12th, 1925, to secure £325, charged on the company's property, present and future, including uncalled capital. Holder: Business Investments, Ltd., 172, Bishopsgate, E.C.2.

Rushden and District Electric Supply Co., Ltd.—Satisfaction in full on June 15th, 1925, of two charges, dated March 28th, 1914, and January 10th, 1921, securing all moneys due or to become due from the company to the Northamptonshire Union Bank, Ltd. (now the National Provincial Bank, Ltd.).

City Notes.

Reports and Meetings of Electrical Companies; Dividend Results, &c.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.

The annual meeting of this company was held on July 2nd. Mr. G. C. Howard who presided, in moving the adoption of the report and accounts (*vide* our last issue, p. 29), said that the balance was much greater than that of the preceding year. The item "Properties, buildings and plant," had been increased by £16,200, representing the cost of a 1,000-kW Belliss & Morcom turbo-generator. This new set was put into operation in February last and was running well and justifying its cost. The plant would probably be fully loaded by the end of the current year and the installation of a further set was under consideration. Their manager, Mr. Marmion, had given evidence before a Commission which the Government had appointed to investigate mining conditions in Kalgoorlie with a view to possible improvements. He had promised that the company would extend its plant to enable the mines to draw their whole power requirements from it at an economical cost. The Commission had recommended the amalgamation of the seven existing mines and the scrapping of obsolete plant. The use of central power and treatment plants was advocated. It was stated that if those recommendations were carried into effect the field might be worked profitably for another 25 years. While the last estimate might be optimistic, the chairman said that it would be the company's future policy to bring down costs to the utmost.

Ward and Goldstone, Ltd.

The report for the year ended March 31st, 1925, shows a net profit of £21,939, of which, it is estimated, income tax and Corporation profits tax will absorb £4,964, leaving £16,975, plus £12,587, the balance brought forward, making £29,562. Interim dividends already paid are:—Preference, at 7 per cent. per annum, £4,340; ordinary, at 7 per cent. per annum, £2,985. It is now proposed to pay a final dividend of 4 per cent. on the ordinary shares, making 11 per cent. for the year (£1,760); and a participating dividend of 1 per cent. on the cumulative preference shares, making 8 per cent. for the year (£640), leaving £19,837 to be carried forward.

The directors have disposed of such of the industrial investments as were negotiable at a profit, and the proceeds have been reinvested in Government securities. £7,500 which stood in the books as a reserve for depreciation on shares has now been allocated to extinguishing the book value of all the remaining industrial shares to a nominal sum, although the directors consider that there is still some value attaching to them. The volume of turnover during the year under review exceeded that of the previous year. Owing, however, to keen competition the margin of profit was reduced. The applications of electricity continue to expand, necessiting additions to plant, and building extensions are in progress. It is anticipated that the extensions will be in operation by the end of the year.

"Underground" Railway Dividends.

The members of the London "Underground" group have declared the following dividends in respect of the six months ended June 30th:—

Underground Electric Railways Co. of London.—3 per cent. on the 6 per cent. first cumulative income debenture stock and 3 per cent. (free of tax) on the income bonds, as in 1924.

Metropolitan District Railway.—2 per cent. on the 4 per cent. guaranteed stock; 2¼ per cent. on the 4½ per cent. first preference stock; 2½ per cent. on the 5 per cent. second preference stock; and 1½ per cent. on the ordinary stock, as in 1924.

London Electric Railway.—2 per cent. on the 4 per cent. preference stock; and 1⅞ per cent. on the consolidated ordinary stock (as compared with 2 per cent. last year).

City and South London Railway.—2½ per cent. on the 5 per cent. preference stocks; and 1½ per cent. on the consolidated ordinary stock (as against 2 per cent. in 1924).

Central London Railway.—2 per cent. on the undivided ordinary stock; and 2 per cent. on the preferred ordinary stock (both unchanged).

No interim dividend is being paid by the *Associated Equipment Co.*

Chili Telephone Co., Ltd.

The directors' report for the year ended March 31st last states that the gross revenue was £186,222, and the profit £42,599. With the addition of £3,816 brought forward, the amount available was £46,415. It was proposed to place £10,500 to the reserve for the renewal of plant; to pay a final dividend of 2s. per share free of tax (making 5 per cent., free of tax, for the year); and to carry forward a balance of £3,095. The provision for plant renewal is necessitated by the heavy expenditure on new plant entailed by the company's concession. Negotiations with the Chilian Government are in progress for an increase in the company's tariffs in order to produce the minimum return on the capital specified in the new concession. In January last the capital of the company was increased to £750,000 by the issue of 31,200 shares of £5 each. None of these shares was taken up by the Chilian public. The exchange value of the peso showed a further decline during the year. The meeting was to be held yesterday (Thursday).

Edmundsons' Electricity Corporation, Ltd.—The directors' report for the year ended March 31st, 1925, states that after providing for income tax, debenture stock charges, and expenses of the ordinary share issue, the net profit amounts to £74,784, as compared with £58,360 for the previous year. With the balance of £16,375 brought forward, the total profit becomes £91,160. Deducting therefrom the interim dividends of 3½ per cent. paid upon the cumulative preference shares and 3 per cent. upon the ordinary shares, there remains a balance of £65,160. It is proposed to carry £20,000 to reserve; a final dividend of 3½ per cent. upon the cumulative preference shares, making 7 per cent. for the year, requires £14,000; a final dividend of 4 per cent. upon the ordinary shares, making 7 per cent. for the year, requires £16,000, leaving £15,160 to be carried forward. Meeting: July 14th.

Prospectus.—*The County of London Electric Supply Co., Ltd.*—The subscription list opened on July 2nd and closed on the same day in the issue of 2,000,000 six per cent. cumulative preference shares of £1 each at £1 0s, 6d. per share. The purpose of the issue was to provide funds for the repayment of the £1,500,000 five and a half per cent. one year bearer notes and for the general business of the company. Applications by debenture stockholders and preference and ordinary shareholders were to receive special consideration. The prospectus stated that the net profits for 1924, after providing for all fixed charges, were sufficient to cover the dividend on the preference shares then issued and on the present issue of 2,000,000 shares more than 3¼ times over.

Crompton & Co., Ltd.—The report for the year ended March 31st last, which was to be presented at yesterday's meeting, recorded a net profit of £20,317 and the addition of £1 458 brought forward made available £21,775. After the payment of the preference dividend a balance of £11,927 is carried forward. The last distribution upon the ordinary shares was 5 per cent. in respect of the year 1921-22.

W. & T. Avery, Ltd.—The balance at the credit of the revenue account for the past year is £121,502, and the disposable surplus £94,096. It is proposed to pay a final dividend of 10 per cent. on the ordinary shares (making 15 per cent. for the year), to transfer £10,000 to reserve, and to carry forward £3,572.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted :—

Newcastle-upon-Tyne Electric Supply Co.—465,000 ordinary shares of £1 each, fully paid, Nos. 1,297,682 to 1,762,681.

Shropshire, Worcestershire and Staffordshire Electric Power Co.—150,000 4 per cent. cumulative preference shares of £1 each, fully paid, Nos. 450,001 to 600,000.

United River Plate Telephone Co.—112,000 ordinary shares of £5 each, fully paid, Nos. 648,001 to 760,000.

Victoria Falls and Transvaal Power Co., Ltd.—A final dividend of 1 per cent., making 10 per cent. for 1924, has been declared on the preference shares, and one of 3 per cent. for the first half of 1925 is also to be paid. The final dividend on the ordinary shares for 1924 is 9¼ per cent., making 12¼ per cent. for the year.

Companies Struck Off the Register.—The names of the undermentioned companies have been struck off the Register, and they are thereby dissolved :—

Central Electrical Engineering Co., Ltd.
Northern Electrical Manufacturing Co., Ltd.

New Indian Company.—A new company has lately been formed at Barsi Bombay, with a capital of 1,500,000 rupees and the title the Shri Bhawami Marathal Mills and Electricity Supply Co. to carry on a cotton mill and to also act as suppliers of electricity.

Tilling-Stevens Motors, Ltd.—On June 30th, Mr. Justice Eve confirmed the reduction of the company's capital by £94,000 by the writing down of the value of the £1 ordinary shares to 8s. The preference shares are not to be reduced in value, but certain arrears of dividend are to be given up.

Notting Hill Electric Lighting Co., Ltd.—An interim dividend of 4s. per share, free of tax, has been declared on the deferred shares.

Traction and Power Securities Co., Ltd.—Interim dividends of 2½ per cent. on the preference stock and 4 per cent., less tax, on the ordinary stock have been declared

Telegraph Construction and Maintenance Co., Ltd.—An interim dividend of 6s. per share, free of tax, is announced.

Stocks and Shares.

MONDAY EVENING.

Few of the markets in the Stock Exchange can claim anything approaching activity. It would almost appear as though the advent of summer weather had already made its seasonal effect felt upon business enterprise. In addition, however, there are various elements at home and abroad that arouse caution in the minds not only of the speculator but of the investor. Industrial conditions certainly do not make for hopefulness as regards the immediate future. As is generally the case when home business is quiet and foreign politics are disturbed, money turns to gilt-edged securities in order to seek, at least, temporary employment. Latterly the outpouring of new stocks has been so fast as to bring about a state of financial indigestion that requires time for its tranquilising, and prices therefore are inclined to hug the dull side. Good stock, nevertheless, is being steadily absorbed.

The only market in which real animation prevails is that for rubber shares, where the strength of the price of the raw material continues to act as a magnet for the attraction of money in large as well as in small amounts. The first batch of Home Railway dividends in respect of the half-year just ended is that of the Underground group, and it must be confessed that the results are not up to expectations. Home Railways as a whole are flat. Material falls occurred to-day, Monday, upon a comparatively slight pressure to sell.

The London Electric and City & South London are both paying reduced dividends as compared with a year ago, the ordinary stock of the former receiving 1¾ per cent. and of the latter 1½ per cent., against 2 per cent. in both cases in July, 1924. No changes are recorded in the cases of the District's 1½ per cent., the Central London 2 per cent., London General Omnibus 3 per cent., and Underground Electric Railways 3 per cent. on the income bonds, the last two being free of tax. The announcements had no particular effect upon the market, though Districts gave way 1 to 47½. At the present rate, it will be noticed that Districts pay seven guineas per cent., and Metropolitan a little over 7 per cent. on the money. Underground Electric income bonds yield 6½ per cent. free of tax, which is equivalent to 7½ per cent. taking tax at 4s. in the £. The electrification of the Southern Railway proceeds apace; this week, Guildford is celebrating the advent of an augmented service of trains now that the electrified portion has extended to its town.

The home electricity market received a good advertisement from the success achieved by the County of London company's offer of two million 6 per new preference shares at 20s. 6d. The subscription lists were open for only a few hours. This is a somewhat remarkable achievement, in that gilt-edged stocks are as a rule heavy and there has been a good deal of under-subscription during the past few weeks in the cases of the best-class securities. The County Company is fortunate in having won the confidence of investors to such an extent that, had the directors wished it, they could have secured, several times over, subscription to the new shares. The allotment letters will be out this week, and it is probable that the price will start at a small premium. Meanwhile, the existing preference remain at 22s. 6d., and the ordinary suffered another small loss at 2½, on sales by a few people who have been able to take substantial profits and have converted these into cash with the idea of taking up the new preferences. The St. James's & Pall Mall Electric has declared an interim dividend of 5s. per share on the ordinary, payable on the 1st of next month. This is the same rate as that distributed a year ago. Midland Counties eased off to 23s. 3d. North Metropolitan shed sixpence.

Whitehall Electric pref. drooped to 19s. 6d. on the slight contraction of profits shown by the last report. The debentures, however, are well maintained at 97½, at which price they would appear to be a sound investment with an element of speculation attached. The yield is £6 3s. per cent. on the money, and interest is payable in April and October.

There is a moderate amount of Tokyo Electric 6 per cent. on offer at 86, giving a return of practically 7 per cent. on the money; or, allowing for redemption by 1948, 7½ per cent. The price is ex the June interest, and according to the last available figures, the interest on this issue was covered ten times over. It is scarcely necessary to refer to the factor of speculation which attaches to anything Japanese by reason of the natural convulsions to which Japan is subject. Barcelona Traction 6½ per cent. prior-lien bonds can be bought at 88, paying 7½ per cent., and amongst other foreign speculative investments it may be mentioned that Anglo-Argentine Tramways 5 per cent. debenture stock is obtainable at 74, offering 6¾ per cent. on the money at that price. A small amount of Metropolitan-Vickers Electric 4 per cent. mortgage debenture stock can be bought at 74½ ex the interest due this month, the yield being £5 7s. 6d. per cent. The interest service is amply covered, and the stock, although redeemable at any time, cannot be paid off under 110.

La Plata Tramways 5 per cent. debenture stock is 6 points up at 67½: otherwise, this section is disposed to dulness. Brazilian Tractions have fallen back to 56½. London United Tramways debenture at 42½ is 3 down. Calcutta Electric Supply debentures have declined to 104½.

Cromptons did better in the year which the new report covers, the net profit of £20,000 being £18,600 up. The ordinary are not to have a dividend yet: the last paid on these shares was in July, 1922. Shareholders can reasonably hope for something next year. Edmundson's profits show a substantial increase over those of the previous year, and the repetition of 7 per cent. dividend on the ordinary is upon the increased capital of the company.

No recovery has occurred in cable stocks and shares. Western Telegraphs are again lower, at 16; Eastern Extensions at 17¼ are ¼ easier. Marconis, on their fall, attracted a little buying, and the price rallied to 28s. 9d. Radios are 11¼ for the common and 10¾ for the preferred. Automatic Telephones reacted to 2 1/16. Chili Telephones are unchanged at 5 7/16. The company's report refers to the offer in Chile of £62,000 of the new capital created last January, but no applications were received. It is rather surprising that the natives of Chile should have failed to take advantage of a new issue of shares that was eagerly taken up in this country. At the Kalgoorlie Electric Power & Lighting meeting last week, the chairman referred to the progress which the company is making, but the price of the 10s. ordinary shares remains at 3s. 6d., while the 6 per cent. income debenture stock is quoted at 50 middle. It is probable that no large amount of either class could be secured in the market at these prices.

British Aluminium have lost 1s. 9d. at 28s. 3d. and Metropolitan-Vickers ordinary shed a florin, going back to 21s. 3d. General Electrics are maintained at 25s., and Johnson & Phillips keep their price at 41s. 3d. India-Rubber shares are scarcely so firm as the nominal quotation of £1 might indicate, there being shares obtainable at about 19s. 6d. The engineering group is quiet: coal mining and railway troubles do not make for public support to this section.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	1924.	Price July 6, 1925.	Rise or fall.	Yield. p.c
Bournemouth and Poole ...	1	18	14	2¾	—	5 1 10
Brompton Ordinary	1	10	10	1⅞	—	*5 14 8
Charing Cross Ordinary	1	14½	15	46/9	—	6 8 2
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	12	12	1¼	—	6 8 0
City of London	1	18	18	47/-	—	5 9 1
do. do. 6% Pref. ...	1	6	6	23/	—	5 4
Clyde Valley	1	8	8	31/-	—	5 3
County of London	1	15	15	29	—¼	5 14 1
do. do. 6% Pref. ...	1	6	6	22 6	—	5 6 8
Edmundson's Ordinary	1	7	7	23/-	—	6 1 9
do. 7% Pref.	1	6	7	22/-	—	6 7 8
Elec. Supply Corporation ...	1	16	10	32/3	—	6 0 4
Kensington Ordinary	5	14	15	12⅝	—	5 16 5
Lancs. Light and Power ...	1	7½	7½	26/6	—	5 13 2
London Electric	1	10	10	35/-	—	5 14 1
do. do. 6% Pref. ...	5	6	6	5⅞	—	5 6 8
Metropolitan	1	10	11	38/3	—	5 15 9
do. 4½% Pref.	1	4½	4½	17/-	—	5 5 11
Midland Counties	1	5½	6	23/3	—6d.	5 4 4
Newcastle-on-Tyne Ordinary ...	1	6	7	32/-	—	6 7 8
do. 5% Pref. ...	1	5	5	18/3	—	5 9 7
do. 7% Pref. ...	1	7	7	35/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10	—	6 0 "
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—6d.	5 9 1
St. James' and Pall Mall ...	5	17½	17½	18¾	—	6 7 8
South London	1	15	15	2 1/16	—	6 8 1
South Metropolitan Pref. ...		7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	17/-	—	4 14 2
do. 6% Pref. ...	1	6	6	20/-	"	6 0 0
Westminster Ordinary	1	15	15	46/6	—	6 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	19 6	—6d.	7 13 10
Yorkshire Elec.	1	8	8	31/-	—	5 3 8

HOME RAILS.

Central London Ord. Assented	Stock	4	4	68	—	5 17 8
Metropolitan	"	4	5	70	— ½	7 2 10
do. District	"	3½	3½	47½	—1	7 7 4
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A" ...	1/-	Nil	Nil	7/6	—	Nil
do. do. Income	Bonds	6	6	93	—	*6 2 5

TELEGRAPHS AND TELEPHONES.

		Dividend. 1923.	1924.			
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def.	"	1½	1½	24½	—	6 3 9
Automatic Telephone	1	3	6	2 1/16	— 1/16	2 18 2
Chili Telephone	5	6	5	5 1/16	—	*5 10 4
Cuba Sub. Ord.	10	5	5	6⅞	—	7 8 2
Eastern Extension	10	10	10	17½	— ½	*5 15 11
Eastern Tel. Ord.	Stock	10	10	17½	—	*5 14 0
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 14 3
do. do. Pref.	10	6	6	10⅞	—	5 10 4
Great Northern Tel.	10	22	22	31½xd	—	6 18 6
Indo-European	25	7	8½	41½	—	*4 4 4
Marconi	1	10	—	1 5/16	+ 1/16	6 19 2
Marconi Marine	1	10	—	1	—	10 0 0
Oriental Telephone Ord. ...	1	12	12	24	—	*5 2 11
United R. Plate Tel.	5	8	8	7½	+ ½	*5 12 3
Western Telegraph	10	10	10	16	— ½	*6 5 0

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8½	—	8 16 0
do. do. 2nd Pref. ...	5	6	"	9¼	—	10 8 8
do. do. 5% Deb. ...	Stock	6	7	74	—	6 15 2
British Electric Traction Ord. ...	"	6	6	112	—	5 7 2
do. do. 6% Pref. ...	"	6	6	104	—	5 15 5
Brazil Traction	100	4	4	56½	—1	7 1 7
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	91	+1½	5 9 11
do. do. Preferred	"	96/-	96/-	86½	—	*5 10 10
do. do. Deferred	"	129/5	129/5	106½	—	*6 1 6
do. do. Deb.	"	4½	4½	75½	—	5 19 7
Lond. & Sub. Trac. 5% Pref. ...	1	2½	—	6/-	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—3	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	62½	—	8 0 0
Mexican Light Common ...	100	Nil	Nil	25	—	Nil
do. Pref.	100	Nil	Nil	61	—	Nil
do. 1st Bonds ...	—	5	5	65½	—	7 12 8
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	2 7/16	—	* 4 18 6
British Aluminium Ord.	1	5	10	2/3d	—	1/9 7 1 7
British Elec. Transformer Pref.	1	Nil	7	17/6	—	... ...
British Insulated Ord.	1	15	15	3⅝	—	4 10 3
Brush Ord.	1	10	10	1	—	10 0 0
Callenders	1	15	15	2½	—	5 2 0
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	⅛	—	... ...
Edison-Swan	4/-	10	10	8/-	—	5 0 0
do. 5% Deb.	Stock	5	5	80½	—	6 4 3
Electric Construction	1	10	10	1⅝	—	6 3 1
Enfield Cable, Pref.	1	7½	7½	1¼	—	6 0 0
English Electric	1	5	5	18/9	—	5 6 8
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	5	7½	25/-	—	6 0 0
Henley	1	15	15	3	—	5 0 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1	—	*5 0 0
Johnson & Phillips	1	10	'10	2 1/16	—	4 17 0
Met-Vickers, Ord.	1	8	8	21/3	— 2/-	7 10 7
do. Pref.	2	8	8	28	—	5 14 3
Siemens Ord.	1	—	7½	25/9	—	*3 17 8
Telegraph Construction	12	19	19	27	—	4 9 0

* Dividends paid free of Income Tax

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.		Price July 7.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	8½d.	—
a Ammoniac, Sal	per ton	£60	—
a Ammonia, Muriate (large crystal)	"	£52	—
a Bisulphide of Carbon	"	...	—
a Borax	"	£25	—
a Copper Sulphate	"	£26 10s.	—
a Potash, Chlorate	per lb.	4d. to 4½d.	—
a " Perchlorate	"	5½d.	—
a Shellac	per cwt.	£15 15s.	—
a Sulphur, Commercial	"	£7 15s.	—
a " Roll	"	£7 10s	—
a Soda, Chlorate	per lb.	3¾d. to 3¾d.	—
a " Crystals	per ton	£5 to £5 os.	—
a Sodium Bichromate, casks ...	per lb.	4d.	—
METALS, &c.			
b Aluminium, Ingots	per ton	£190 to £125	—
b " Wire	per lb.	1/9 to 2/6*	—
b " Sheet	"	1/6 to 2/-	—
e Babbitt's Metal and Anti-friction Metal—			—
Grade I	per ton net	£231	£2 inc.
Grade II	" "	£165	£ inc.
Grade III	" "	£91	£1 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	9½d.	—
c " Tubes (solid drawn) ...	"	1 1/16d. to 1/-	—
c " Wire, basis	"	9½d.	—
c Copper Tubes (solid drawn) ...	"	1/1	—
c " Bars (best selected) ...	per ton	£90	—
c " Sheet	"	£90	—
c " Rod	"	£90	—
d " (Electrolytic) Bars ...	"	£65	22s. 6d. inc.
d " " Sheets ...	"	£145 10s.	—
d " " Wire Rods ...	"	£75	22s. 6d. inc
d " " H.C. Wire ...	per lb.	9 1/16d.	—
f Ebonite Rod	"	2/- to 3/6	—
f Sheet	"	2/- to 3/6	—
a German Silver Wire	"	2/3	—
b Gutta-percha, fine	"	3/1	—
b India-rubber, Para fine	"	3/1	6d. inc.
f Iron Pig (Cleveland Warrants) ...	per ton.	nom.	—
f " Wire, galv. No. 8, P.O. qual.	"	£28	—
g Lead, English Pig	"	£25 5s.	10s. inc.
g Mercury	per bot.	£14 to £14 5s.	5s. inc.
e Mica (in original cases) small ...	per lb.	3d. to 8/-	—
e " " medium	"	4/- to 8/-	—
e " " large ...	"	10/- to 20/- & up.	—
g Phosphor Bronze, plain castings	"	1/8½	—
g " " drawn bars & rods	"	1/8	—
g " " rolled strip & sheet	"	1/9½	—
g " " wire	"	1/8½	½d. inc.
c Platinum	per oz.	£26	—
d Silicium Bronze Wire	per lb.	1/0½	—
f Steel, Magnet, in bars	"	7½d.	—
e Tin, Block (English)	per ton.	£255 to £255 10s.	45s. inc.
h " Wire, Nos. 1 to 16	per lb.	3/11	—

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
k P. Ormiston & Sons.
l Johnson, Mathey & Co., Ltd.
m C. Clifford & Son, Ltd.
r W F Dennis & Co

The Shannon Power Scheme.—The Shannon Electricity Bill has now finally passed the Irish Free State Senate, and will receive the Governor-General's assent forthwith. In the closing stage a final protest against the measure was made by Sir John Keane, who argued that the scheme was not economically sound. He was alone in his opposition.

An Electricity Supply (Special Powers) Bill has been introduced in the Free State Parliament to confer special powers for a limited period on certain supply undertakings and owners of generating stations with a view to the more economical supply of electricity pending the availability of electricity supplied by the State under the Shannon scheme.

The Irish Free State Parliamentary Committee on the River Liffey Electricity Bills rejected the East Leinster Syndicate's Bill in favour of the Dublin Electricity Bill promoted by Sir John P. Griffith and others, and the examination of the clauses of the latter Bill will proceed without further questions. The Dublin Corporation's Special Bill was withdrawn, at the request of the Government, after the preamble had been proved.

A Name for 2π-times-the-frequency.—In *Science* of June 5th a letter is published in which Mr. A. T. Jones, of South College, U.S.A., refers to the need for a name for the quantity p which represents 2π times the frequency of a simple harmonic motion, and which appears in the equation $v = V \sin (pt - a)$. Various terms have been suggested by famous physicists, but none of them has been generally adopted. The writer now proposes to call this quantity the "π-frequency." This expression is easily spoken and printed, and suggests a close relationship with frequency.

The International Railway Congress.

A Review of some of the Electrical Features.

(*Continued from page* 11.)

High-speed Electric Locomotives.

The whole of June 26th and the morning of June 29th were occupied by Section II by a discussion of high-speed electric locomotives; two reports were submitted, dealing with the practice and tendencies in America and other countries. Mr. J. T. Wallis (Chief of Motive Power, Pennsylvania Railroad System), reported on American practice, and Mons. M. Weiss (Engineer-in-chief, Swiss Federal Railways and President of Section II) reported upon the practice in other countries. The two reports were analysed in a special report submitted by Mons. Weiss, who put forward the following findings:—

There were relatively few electric high-speed locomotives (running at speeds above 75 km. (46.4 miles) per hour) in service, or at present being constructed; such locomotives ran on, or were intended for, the following railway systems:—

America: Chicago, Milwaukee and St. Paul; New York, New Haven and Hartford; New York Central; Chilean; Paulista; and Pennsylvania Railroads.
Germany: German State Railways.
Austria: Austrian Federal Railways.
England: Metropolitan Railway.
France: French Midi Railway; Paris, Lyons and Mediterranean Railway; and Paris-Orleans Railway (the two last named were in process of electrification).
Italy: Italian State Railways.
Sweden: Swedish State Railways.
Switzerland: Swiss Federal Railways.

Information had only been obtained of high-speed locomotives without carrying axles operating on the Metropolitan Railway, the Paris Orleans, and the New York Central; the two latter administrations had also locomotives with carrying axles and bogies. The transmission of the tractive effort from the motors to the driving wheels was effected by very varying methods—by the direct drive, by connecting-rods, and by driving through gearing and coupling rods. The locomotives with connecting-rod drives had the advantage, possessed also by steam locomotives, of having a higher centre of gravity than the other types of locomotives, which was of importance for securing good running. This arrangement, if well made and well maintained, provided that it was also fitted with spring driving gear, appeared to give good results. The rotating masses on electric locomotives could be accurately balanced, so that there was no production, as in steam locomotives, of additional load due to hammer blow; hence, it was possible to increase the axle load, which, in the case of a locomotive on the Pennsylvania Railroad was 35 tons, and on the Swiss Federal Railways 20 tons.

With the Westinghouse drive (with hollow shafts and driving through springs), spring breakages frequently occurred when the axle load was high, and when concentricity of the driving axle and of the hollow axle could not be accurately maintained in service, a fact that was particularly to be feared on locomotives having more than three driving axles on one frame.

In locomotives with a relatively low centre of gravity, with consequently greater stresses on the superstructure (due to lateral shock), it was advisable to reduce the axle load as much as possible. On locomotives on the Paris Orleans Railway the load was 12.4 tons, and on the New York Central from 15 to 17 tons. In order to obtain good stability in running for high-speed locomotives, a long wheel-base should be provided. The leading wheels with lateral play (radial axle boxes) and leading bogies were generally fitted with restoring gear (springs or inclined surfaces). The restoring force varied greatly from 0 to 14,800 lb., according to the various types of locomotive.

The methods adopted for collecting current were generally of the two following types:—(*a*) Overhead collectors of the pantograph or bow forms, which were in general use on lines using single-phase current, and also often used on d.c. lines. In all cases the collector was raised by compressed air, with the exception of the Midi Railway, on which it was lowered by this means. The contact pressure of the collectors on the wire varied from 22 to 33 lb. for d.c. and from 6.6 to 11 lb. for alternating and three-phase current. (*b*) Collector shoes, only used on d.c. lines.

The main switch was either constructed with a magnetic blow-out, with or without high-speed break (the latter method was coming more and more into use) for d.c., or with a multiple-break oil-break for a.c. The main switch was controlled differently on different administrations, either by hand, by compressed air, or electro-pneumatic, electro-magnetic, or electric control. The control gear appeared to be settling down into the two following main forms:—(*a*) For d.c. and to some extent for single-phase current, a controller with contactors; (*b*) for a.c., either controllers with contactors, or in the form of cylindrical contacts or appliances consisting of contacts arranged near together with special contacts for breaking the spark. It would appear that the electro-pneumatic control was in most general use up to the present.

The transformers required on single-phase locomotives, and to some extent also on three-phase locomotives, were of the oil-immersed, or air-cooled types; it might be said that the oil-immersed type appeared to be more favoured than the other. The cooling of the transformer was generally effected by means of fans.

The external form and dimensions of traction motors varied with each type of locomotive; between the lowest-powered locomotives (of from 185 to 275 h.p.), of the Metropolitan Railway and the Midi Railway, and the highest powers (3,000 h.p.) of the German State Railways, all intermediate powers might be found. The mean value was from 550 to 600 h.p. The cooling of the motors was, with few exceptions, effected by special fans. Where d.c. was used, insulation generally presented some difficulty; with a.c., on the other hand, the weak point was the commutator; experience showed, however, that the cost of maintenance under some conditions could be considerably reduced, and the mileage run after turning up until this was again required might be high (94,000 miles on the Swedish State Railways).

The auxiliary electrical equipment of the locomotives did not vary appreciably for different types of locomotive. The question of train heating had not yet been definitely settled, but it appeared likely to be generally effected, in Europe at any rate, by means of resistances on the trains.

Direct comparison of the power of these locomotives was rather difficult, owing to the fact that at present there were no existing international standards that defined the maximum permissible heating of the motors and the methods by which the tests should be carried out.

It was pointed out by Mr. Weiss that present experience was not sufficient to enable them to judge which types of locomotive were best suited to through-train service. Further experience was necessary before it would be possible to make certain which type, using a particular type of current, and under actual conditions of working, would be the most suitable for this purpose. In particular, it would only be after further experience that they would be able to ascertain which method of driving was best suited to these locomotives—through connecting rods and coupling rods, or the direct drive.

Mr. WALLIS, in his analysis of American practice, said that there was a tendency towards greater application of the principles followed in steam locomotive design, and towards greater co-operation between electrical and mechanical engineers, a very hopeful indication.

Discussion.

Mr. BACHELLERY (of the Midi Railway, France) referred to the working on that railway of electric locomotives of the two-truck type with ordinary tram-geared motors. They behaved quite well on the track at a speed of 55 miles an hour, which they normally attained. There had been a little trouble with the collector brushes, which had had to be modified. With regard to the mechanical side, he said that, in order to attain high speeds, it was necessary to couple the trucks together as tightly as possible. He had found it necessary to supplement the drawbars between the trucks with lateral buffers, which did not allow lateral movement, and that gave good results.

Mr. LEBOUCHER (Midi Railway) said he had had considerable trouble with brushes, owing to inertia effect, but by dividing the brushes, and thereby reducing the inertia, the locomotives could be run at speeds of 100 kilometres (about 62 miles) an hour without flashing or other difficulties.

Mons. G. BIANCHI (Italian State Railways) said that in Italy they used double-bogie locomotives with a spherical coupling, and had no difficulty with them when running up to 110 km. (70 miles) per hour. He considered that the difficulties with brushes were due to high-voltage, and that possibly the higher "tension" in France as compared with Italy would lead to more trouble in the former country. In reply to a question, Mons. Bianchi said that the motor was spring-borne on the locomotive he had referred to.

Mr. WEISS, discussing connections between bogies, said that on the Swiss railways they had suffered from excessive tire wear on express passenger engines. This led to the introduction of a special coupling, by means of which the leading bogie guided the trailing bogie and prevented the leading wheel of the trailing bogie pressing too heavily on the rail. By this means tire wear had been reduced.

Mr. BIANCHI said that in Italy they had 535 electric locomotives with the rigid rod drive, and there were no means of adjusting the centres of the rods. The maximum play allowed was 0.2 mm.

Mr. WALLIS said that in the United States it was the general feeling that all engines should have springs between the rods and motor shafts. Some locomotives were running without them, and there was a tendency to do away with them in the lower-speed locomotives. Most people who were

considering high-speed locomotives in America, however, wanted to use springs to take care of the shaft between the motor and the rods. There was very little difficulty with regard to the maintenance of the rods of high-speed locomotives so far. There were about 33 rod-driven locomotives on the Pennsylvania railroad with no spring arrangement, but there was a slip arrangement by which the crank slipped on the motor shaft, and pressure was exerted on a disk that was supposed to take care of the inertia of the motor, but experience showed that it was very rarely necessary for this arrangement to come into action.

Mr. WEISS, dealing with gearing and lubrication, said that on the Swiss railways different types of gear were used, none of which had given any difficulty, although it was rather early yet to make any definite statement. It was essential that the gears should be very carefully made. Oil was used entirely for lubrication and, although there had been trouble at first through leakage of oil through the boxes, that had been overcome.

Mr. BACHELLERY discussed some of the peculiarities of the gears used on the Midi Railway. There had been a lot of trouble with a gear which was fixed on the axle, because the axle was liable to break between the gear and the wheel. To do away with that difficulty a new type of gear was designed, with simply a gear rim fixed to part of the wheel centre, so that the effort was transmitted, not to the axle, but to the wheel itself. Very good results had been obtained with that. Moreover, on the locomotives developing high tractive effort there was generally a double gear, one at each end of the axle, so that the effort was perfectly balanced. Grease only was used for lubrication; that gave very good results, and the gears wore very well.

Mr. WALLIS said that on the latest locomotives on the Pennsylvania railroad that method of attaching the gear to the shaft had been utilised. The bearing was on the hub of the wheel, and the shaft went through that, so that in America they accepted the same practice as had been described by Mons. Bachellery with regard to the connection of the gear on heavy locomotives.

Mr. LEBOUCHER said that on the Midi Railway they used a pump for the continuous lubrication of high-speed locomotives with vertical motors, and transmission of the power by right-angled pinions. The result had been satisfactory.

Mr. WALLIS referred to a locomotive used in America of which all the bearings in the motor assembly were oiled by means of a circulating pump. The gears were lubricated with grease. The circulating pump was mounted on the shaft of the gear.

The question then arose as to the use of directing axles on electric locomotives, and the weight on axles.

Mr. BIANCHI said that the Italian railways had locomotives with a speed up to 100 kilometres (62 miles) per hour, with no directing axle at all.

Mr. BACHELLERY said that on the Midi Railway there was no difference in axle weight as between steam and electric locomotives, and it was considered that, for a particular axle weight, the electric locomotive was safer than the steam locomotive, because with the former there was no alternating effort on the track. Thus, in electric locomotives they had a weight up to 18 tons for the driving axle, and on the two-truck electric locomotive, which attained a speed of 55 miles per hour, there was an 18-ton axle without any directing truck. For locomotives attaining a speed of 65 miles per hour, it was considered advisable to use directing trucks.

Mr. H. PARODI (Paris-Orleans Railway) raised the question of the disposition of axles as between electric and steam locomotives, pointing out that a steam locomotive was usually turned round at the end of its journey and, therefore, always pulled in one direction, but that an electric locomotive was not usually reversed, and it was necessary, therefore, to design it so that it would pull at high speed in both directions.

Mr. WALLIS said that on the Pennsylvania railroad an electric locomotive had been built having a single truck at each end. When tested and compared with a steam locomotive, there was no difference between the two from the point of view of pressure on the track. The two ends of the electric locomotive were alike, except that the truck at one end was connected to one pair of drivers, and that at the other end to three pairs of drivers.

Mr. BACHELLERY said that the high-speed electric locomotives of the Midi Railway, attaining a speed of 130 kilometres (80 miles) per hour, had a symmetrical disposition of axles, and had not given any trouble from the point of view of stability on the road. He was glad to hear Mr. Wallis say that the same conclusion had been reached on the Pennsylvania railroad, because about 20 years ago they had concluded that the symmetrical arrangement was a source of trouble at high speed.

Mr. WALLIS said that the original conclusion was based on an improper arrangement of the springs, and that, had the springs been modified, the subsequent conclusion would have been reached in the first place.

Mr. BIANCHI, comparing steam and electric locomotives from the point of view of mileage covered without repair, said that in Italy electric locomotives had covered a mileage of 75,000, as against about half that amount by steam locomotives. The mileage of the electric locomotives had since been reduced, for service reasons.

Mr. PARODI considered that the mileage of electric locomotives was about twice that of steam, under the same operating conditions.

Mr. WEISS said that the difference between the two in Switzerland was not so great. His figures were 50,000 miles for steam, and 60,000 for electric engines.

Mr. LACOIN (Paris-Orleans Railway) pointed out the difference between the distances run in Switzerland and Italy, and said that this question was one which had to be considered, not only from the electrical and mechanical points of view, but also in relation to service and the general organisation of trains.

Sir HENRY FOWLER (L.M. & S. Railway) said that the figures given by Mr. Bianchi were low as compared with the English standard, and needed to be multiplied by three or four.

Mr. WALLIS said that the first three electric locomotives built by the Pennsylvania railroad, in 1910, compared favourably, from the point of view of repairs, with steam locomotives. There was regular repair of the running gear, boxes, wheels, tires, &c., in both types. The electrical repairs amounted to practically nothing, and, since 1910, only in the case of four or five of the electric locomotives had re-winding been necessary. He had not the exact figures of mileage, but it was at least 100,000 miles between repairs of wheels and tires; between repairs of motors it was much greater.

The next question discussed was whether it had been found that the presence of the oil necessary for the circuit breakers used with alternating current or with the transformers gave rise to any danger in working.

Mr. BIANCHI said that in Italy they had had experience of interruptors working in oil, but they had given trouble owing to the breaking of the containers. This only applied to locomotives working on the industrial frequency.

Mr. F. STEINER (Swiss Federal Railways) said that undoubtedly there was danger if oil were used in transformers, both as regarded explosion and fire. The danger could be reduced by paying particular attention to weak points of construction of the apparatus. The remedy was also to be looked for in the direction of the use of air insulation rather than the use of oil.

Mr. WALLIS did not think the subject was nearer settlement in America than in Switzerland. They had not enough engines running to produce sufficient experience to enable a final design to be arrived at. Nobody had objected so far to the oil transformer.

On the question of what type of remote control had given the best results, Mr. BIANCHI said that in Italy electro-pneumatic control had given the best results.

Mr. WALLIS said that both electric and electro-pneumatic control were used in America, and he believed experience there was the same as in Italy.

Mr. LEBOUCHER said that on the Midi Railway cam control had been adopted. It appeared attractive at first sight, but had certain disadvantages, particularly when it was desired to cut off the current, the principal trouble being with the pneumatic blowers, which were of different patterns. In the end they were obliged to cut the current off by the main switch, which caused a rise in voltage on the locomotive and an unfortunate effect on the line. Consequently they were adopting electro-pneumatic control for the latest machines.

Mr. PARODI said that the Paris-Orleans Railway made tests 20 years ago with the purely electric and electro-pneumatic systems, and had chosen the latter.

(To be concluded.)

The 27th Anti-Aircraft Battalion, R.E., T.A.—All suitable candidates for enlistment in the 27th Anti-aircraft Battalion R.E. (London Electrical Engineers), of the Territorial Army, are cordially invited to call at the battalion headquarters, 46, Regency Street, to receive any information desired concerning the unit's activities. This unit was founded originally by the late Dr. John Hopkinson in 1898, and served during the South African War, and it still carries on the old traditions of good work and fellowship. Technical knowledge is not an essential qualification for recruits, and any who show keenness and intelligence will be welcomed and helped to become efficient members of this progressive and well equipped force. The primary rôle of this unit lies in the defence of London against enemy aircraft, and it has an up-to-date plant, including searchlights, stationary 40-h.p. generating sets, lorries, sound locators, and all the minor accessories. The terms of enlistment are, initially, four years' service, with an optional minimum of one year, and the age limits are 17 to 50. Each member is required to attend 40 drills of one hour each, a one-day's musketry course and a summer camp of 15 days, usually at a seaside place, during the first year; and 20 drills, and the other obligations of the first year, during the subsequent years. The camp pay for N.C.O.'s and men ranges from 2s. 9d. to 14s. 0d. per day, according to qualifications and rank; and everything is found, uniform, kit and equipment being provided. Marriage allowance is paid to married men over 26 years of age. The training is of a most interesting character and affords the opportunity to learn the groundwork at least of certain branches of electrical and mechanical engineering. Displays, such as those at tattoos, and the Royal Tournament at Olympia, which are frequently operated by the unit, add to the interest of the duties. A billiard table, canteen and miniature rifle range are among the provisions made at the headquarters for the social entertainment of members.

The Incorporated Municipal Electrical Association.

Annual Convention at Brighton.

(*Continued from page* 34.)

Are Supply Authorities doing their utmost to develop the Demand for Electricity?

By W. H. THICKETT (Chairman, Grimsby Corporation Electricity Committee). (*Abstract.*)

The annual output of electricity by statutory undertakings has increased during the last 20 years from about 500 million kWh to some 5,000 million kWh. In 1918 the municipal output was 2,367 million and in 1924 3,821 million. This output, I may point out, is nearly double the corresponding output by companies. Yet in spite of this progress the output of electricity per head of the population in Great Britain remains far below that of many other countries.

The number of "authorised undertakings" in Great Britain on March 31st, 1924, amounted to no fewer than 560. An analysis of the total number of generating stations shows that, of 341 stations submitting returns 224, or 41 per cent., generated less than one million units each, while 398, or 73 per cent. of the stations, generated less than ten million units each. It is apparent that there is great scope for re-organisation on lines which will lead to the more economical production of electricity, by concentrating the generation in fewer well-placed inter-connected stations and thus leading to the supersession of many of the small and uneconomical stations, both public and private, as cheaper and reliable supplies become available from such centralised systems. Since the establishment of the Commissioners, local generation at 37 small stations has been entirely superseded by bulk supplies, and in upwards of ten further cases similar stations have been relegated to the position of stand-by sources of supply only. This desirable process needs to be accelerated.

The present consumption of electricity in Great Britain is about 130 units a year per head of the population. Yet the average consumer in the best organised, lowest priced districts, has been proved capable of using some 2,000 to 3,000 units a year instead of the 200 to 300 required for lighting alone. Recent experience in those districts has shown that the average consumption throughout the country might easily be brought up from 130 units per head to somewhere between 500 and 750 units.

How are we to effect this? We must first realise the obstacles; these—excluding, of course, obstacles at present inherent in the national organisation of the industry—may perhaps be classed in the following order:—Cost of appliances, installation, &c.; lack of knowledge by the people; and cost of electricity in certain districts.

It is a well-known fact that a large number of the most practically useful and far-reaching scientific discoveries have been made by men whose aim was simply the discovery of truth. This always must be the governing aim of the true searchers after knowledge, and I will suggest to you very strongly that research can only be conducted and encouraged on these broad lines. We must do all we can, working both through such an organised body as the British Electrical and Allied Industries Research Association, and through every private channel we can devise, to see that a constant all-round effort of research into every kind of electrical problem is kept up and generously provided for. If we do this, we shall not find the practical and profitable results wanting; but if we refuse to take this broad view, and refuse to encourage any research of which we cannot at once foresee the practical and profitable issue, we shall be wasting the money that we do spend.

Closely related to research, and of extreme importance in dealing with the problem of domestic supply, is the question of standardisation. The term "Standardisation," is no doubt inappropriate. It seems at once to convey the idea of crystallisation and the setting up of an unalterable standard. Too much stress cannot be laid on the fact that industrial standardisation need involve no such dangers. Specifications prepared by the B.E.S.A. are rather in the nature of handy tools to be used in contracts for the purchase of materials and apparatus on the most economical lines.

The British Standard Specifications are arrived at by unifying the needs of industry and recommending what is best in present practice and what can be adopted by industry with the least possible disturbance. In its broadest sense this policy means national simplification, the reduction of the number of types and patterns used for one and the same article. Proper safeguards are needed, of course, principally a thorough periodical review and revision of the specifications.

I suggested to you that the first obstacle to the growth of the electric home might be regarded as the cost of the appliances and installation; and it is to research and standardisation that we must look to remove this basic disadvantage. One hears eminent and able men in charge both of municipal and of company undertakings who say that the great domestic development must pay its way from the first, and can only be carried out where there are profits to be obtained from such a speculative enterprise, and so on. Why? These same men in the past progressed by steady steps, with courage rather than with caution, and the reward and stability of the domestic business is apparently likely to be higher than anything we have enjoyed in the past.

We have in this country been making electric cookers which would cook, for possibly 30 years. During the past ten a really practical appliance has begun to emerge, and in the last four or five years we have had put at our disposal some very sound stuff, any minor defects in which are disappearing rapidly. Yet the full electric cooking range for domestic use is apparently now being turned out by no more than a bare dozen manufacturers. They are producing something like 15,000 or 20,000 ranges a year, and the curve of output is rising rapidly. There are probably not less than 50 undertakings offering electricity at rates which make it easily competitive with gas and coal for cooking. If we assume, on a normal basis of calculation, that such areas include a quarter of a million houses, or about one-fifth of the total number of houses connected with electricity supply, to provide those people with cookery appliances on our present production basis looks like a ten-year job. These facts suggest a further question. How far can we expect at present to compete with coal and gas purely in the matter of price, and how far should pure consideration of price affect our attitude towards efforts at domestic development?

Equally essential, I believe, is uniformity of price. Not only do the present wide discrepancies between different areas render impossible any uniform national policy of publicity and development, but they undoubtedly convey to the consumer an impression of uncertainty and unstability which disinclines him to "go all out" on electricity, even if he lives in one of the best and cheapest areas. He feels that he may, if he moves, find himself in an area where he will not be able to afford to use electricity for any but a few purposes. Hence he hesitates to equip his house with a full range of electrical devices, and accustom his family to use them. He is inevitably led to look on electricity rather as an occasional luxury than as a universal necessity.

There is ample scope for greater foresight and enterprise in paving the way for domestic electrification by the extension of wiring facilities rather in anticipation of, than in response to, specific demands. The extension of mains and cable networks is a perfectly sound investment which should be carried out progressively on generous, far-seeing lines. Ample cable work is relatively much cheaper than restricted cable work. Some undertakings are already laying down from 100 to 400 miles of cable a year.

There are at least 100,000 houses in Glasgow suitable for electrification. Most of these are occupied by tenants on a yearly rental basis. Hence the difficulties of arranging for electrification must obviously be greater than if the houses were occupied by their owners, who would stand to gain directly through the increased value of their properties once electricity had been introduced. After various ineffectual efforts to deal with the problem Mr. R. B. Mitchell, engineer and manager of the electricity department, devised a plan for wiring houses on the easy payment system, with a view to making a studied inroad on the large number of unwired houses in the Glasgow area. In September, 1924, the Glasgow Corporation approved the scheme and it was put into operation. The cost worked out at £4 10s. for a five-roomed house, to include eight lighting points and three plugs, and in spite of various obstacles 640 houses were wired in the first six months and no bad debts were incurred.

In one of the residential districts of Brighton Mr. Charles Blaker and his architect, Mr. E. Weir, have been building labour-saving houses comprising two floors, four bedrooms, two reception rooms, with bathroom and usual offices, which they are able to offer to the public at a price of £1,030 or a little over. Each house has one coal fireplace in the dining room and one central water-heating stove of the "Glow-worm" type in the kitchen. Only two flues are necessary, but in construction a six-flue chimney has been employed, the spare ducts being used to ventilate the rooms, which they do very effectively. Other artificial heating for the different rooms including the dining room in all but the coldest weather, is provided by electric fires. The omission of the usual complement of fireplaces, chimney breasts and flues is of great importance. The saving effected by this radical change in design is far more than sufficient to cover the whole cost of a full range of electrical equipment.

It is impossible to speak of the problem without a word on tariffs, but I do not wish to enter into the technical details of the various possible tariff systems. My own views are in agreement with those expressed at the Institution meeting by my friend and colleague, Lieut.-Col. W. A. Vignoles, D.S.O. I take this summary of part of his remarks from the ELECTRICAL REVIEW:—

"They must have a one-meter tariff. The only practical tariff was the plain two-part one, with a fixed charge per year, plus 1d. per kWh. That had proved to be successful, and he was certain that they would all adopt it sooner or later. It was difficult for a Government department to make anything compulsory, but the Commissioners' Committee which proposed to fix the first charge would, if it tackled the matter

properly, solve their difficulty. He maintained that the tariff problem was settled, and that now they must get down to the business of selling electricity by the same means as were used for selling other commodities."

To selling electricity—yes, that is our business too often neglected in the past. But I should like to emphasise to you that it is useless to sell electricity by itself as an impersonal commodity. Every sale of electricity must be accompanied by a generous giving of service. Our aim must be to sell to the consumer not lamps, stoves, and motors, but light, heat and help.

Let me draw your attention to one field in which Great Britain is at present most certainly not "making the most of electricity." I refer to agriculture. In this connection I would commend to your notice the pamphlet entitled "Electricity on the Farm," written by Mr. R. Borlase Matthews. There is plenty of work for electricity on the farm, and the need for it there should, I suggest, be earnestly and increasingly considered by all undertakings whose power lines are within convenient reach of agricultural areas.

Electricity and publicity—our business as electrical suppliers requires the closest, the most constant union between the two. I think it may safely be said that in the past our publicity work has been far and away the weakest point in the whole organisation of the electrical industry, and that this weakness has been more fully responsible than any other single cause for the inadequate use made of electricity throughout the country. We must realise that the electrical industry, on account of its high overhead charges, is very particularly dependent on a larger and constantly increasing demand for its product. The only way of creating this demand is through educational publicity. There are two broad kinds of publicity—the one personal and local, the other co-operative and national.

The E.D.A. is just now asking for modestly adequate funds to continue the work which it has been doing for the past five years. Its present demand is for really less than sixpence per year per consumer, and the contributions from each undertaking are very small indeed compared with the total volume of its business and its expenses. When this small contribution is sent forward into the central exchange, the whole value of the work which it makes possible comes back to the contributor. The E.D.A. classes its publicity work under three broad heads:—

Educating the consumer in the various uses and applications of electricity supply.

Assisting him to obtain appliances and material.

Securing the sympathetic interest of all in the electrical industry, and enthusiasm for the electric method in home, business and industrial life.

Just as publicity must be of two kinds, national and local, so its appeal must, broadly speaking, be of two corresponding kinds—general and personal. We have first to create a general atmosphere favourable to electrical development. We need for this a wide diffusion of knowledge as to the advantages and capabilities of electricity. We must see that every man and woman in the country, whether a user of electricity or not, has a firmly impressed notion of what electricity can do for social progress and domestic efficiency. We must cultivate the idea of an "Electrical Age" as, from the point of view of social organisation, a golden age, a noiseless soot-less age swift and clean, ever-ready and trouble-free. We can do this both by making clear what electricity has already achieved in those countries and districts where it is most used, and by explaining in detail what more it might do if the public would only give free scope to its services by asking for them. A general broadcasting of electrical propaganda is necessary and valuable, but it is not enough. From the central power house of our publicity we must carry our lines of propaganda into every individual household and there light the lamps of electrical knowledge.

Discussion.

The PRESIDENT said that although the paper was addressed principally to Committee members, it also provided a stimulus for engineers and managers to impress upon their Committees and Councils the importance of supporting the three Associations relating to research, standardisation and publicity referred to in the paper.

Mr. LL. B. ATKINSON said that his main object was to bring the importance of research and the need for supporting it financially, to the notice of members of Electricity Committees. The whole electrical industry was founded upon research, and its continued prosperity depended upon research being continued on a very large scale. There were two classes of research; *viz.*, that carried out by individual firms for their own special benefit—a very legitimate class of research—and that carried out for no one's special benefit, dealing with the fundamentals of the industry and therefore only to be carried out effectively co-operatively. As far as the first type of research was concerned, it was estimated that a sum of £250,000 per annum was being spent in that manner. As to co-operative research, with which he was more particularly concerned and which dealt with materials and substances and methods, and promised no particular benefit to anyone and yet was of primary importance to the proper development of the industry as a whole, the sum of only £20,000 a year was being spent on this, partly provided by the State and partly by a group of manufacturers, and this in an industry which must be reckoned not in thousands but in millions of pounds sterling. Dealing specifically with the electricity supply industry, he said that the placing of this largely in the hands of municipalities was a great social experiment. Public control of great industries involved very considerable responsibilities and, so far as research was concerned, he could not but say that they had failed lamentably in taking their share of those responsibilities. That was due to the fact that they had not understood what research could do. The engineers had understood it, but the Committees and Councils had not, and therefore he wished this paper to be a starting point for Chairmen and members of Committees. He believed that when they fully understood the importance of the point he was stressing they would come forward and assist in the work of the Electrical Research Association to a much greater extent than in the past.

The HON. SECRETARY then read a letter from the Electricity Commissioners in which attention was called to the position of the Electrical Research Association. It was pointed out that at present the Association was mainly financed by the B.E.A.M.A., and an equal contribution from the Department of Scientific and Industrial Research. The Commissioners had been informed that there was a possibility that the financial grant from the Department might cease after this year or might be given on a descending scale for a limited period. In these circumstances it was evident that unless some additional source of revenue could be secured, the work of the Association, which had already proved of considerable value to the electricity supply industry might have to be curtailed or discontinued altogether, and the Commissioners were confident that on the position being made known, the necessary support for the continuance of the work would be forthcoming from authorised undertakers and others directly and indirectly concerned in the activities of the Association. The Commissioners expressed their sympathy with the endeavour of the I.M.E.A. to secure support from its members, and stated that they were prepared to sanction the payment of reasonable subscriptions in this connection under Section 30 of the Act of 1919.

Mr. C. LE MAISTRE (Secretary of the British Engineering Standards Association), in asking for additional support for that body, spoke of the manner in which the work was restricted through lack of funds. At present something like 300 standard specifications were in hand, but it had been possible to issue only 45 of them for this reason, and the work of the Association was being starved through inadequacy of office accommodation and staff. The endeavour was being made to secure that its work should be effective throughout the world, and he impressed upon the meeting the great savings and convenience which would result all round if British standard specifications, with the imprimatur of a body like the B.E.S.A., were generally adopted and were translated into foreign languages. The general aims of the Association were being copied by the Americans, who had put a large scheme in hand in an endeavour to secure as much as possible of the trade in South America, and they were spending money very freely on standardisation in America. Last year the subscriptions to the B.E.S.A. from private sources amounted to £12,000 and the sum received from the Government was only 100 guineas. He hoped that that would be remedied and in order to increase the private subscriptions, a scheme had been put into operation whereby professional business and other men connected with the industry, including firms and municipalities, could become members on a two-guinea subscription, which would carry with it certain privileges. He expressed the hope that municipal electricity supply authorities would support this work both in the interests of the development of the industry here and also in assisting us more effectively to meet foreign competition.

Mr. J. W. BEAUCHAMP (Director of the Electrical Development Association) spoke of the work of that body and the new scheme of subscriptions sanctioned at the annual meeting a short time ago on the basis of the payment of a subscription amounting to one-tenth of one per cent. of the revenue of supply undertakings, the manufacturers having promised to contribute to an increased extent. The details of that, he said, and arguments in favour of the scheme, had been set out in a booklet which was being distributed to all municipal and other supply authorities. Hitherto the Association had been working on a subscription of about £5,000 a year, but the amount of money required to carry out a more intensive propaganda was four times that amount. Since the booklet to which he had referred had been distributed three weeks ago, he thought he could see half the extra sum in sight and his visit to the Convention had been extraordinarily successful in obtaining promises of support. He concluded by saying that he had got to have this money and that whatever might be the result of the appeals on behalf of research and standardisation, he knew the industry would provide him with what he wanted.

Ald. JAMIESON (Glasgow) said he would recommend his Council to support the Associations mentioned in the paper. The Belfast Gas Department contributed £900 a year to its various Associations.

Councillor W. HAMMER (Hackney) said that what was wanted was to take every possible step to secure full wiring powers for the municipal electric supply authorities, because 90 per cent. of the people of this country lived in small houses and had very small incomes, so that unless some system could be adopted for wiring these places through municipalities, these people would never get the advantages of electricity.

Councillor HIGGINS (Glasgow) said that the average man or woman did not need to be convinced of the benefits and advantages of electricity supply; what they wanted was to be able to secure it at a price within their means, and he wondered how

many municipal electric supply authorities were endeavouring to find a solution of that problem. In Glasgow an endeavour was being made to deal with it by means of an assisted wiring scheme, and further efforts in that direction were necessary.

Councillor CONOLLY (Salford) alleged that councillors and would-be councillors had more to do with retarding the growth of electricity than anybody else. There was no doubt that more research work was necessary if electricity was to be developed on the right lines and yet as soon as funds for this purpose were suggested, there was opposition in councils and committees. The development in Salford had been very much held back because of this class of opposition.

Councillor TUMMON (Sheffield) said that although many interesting things had been said with regard to the importance of research, standardisation and publicity, he would like to get down to something of practical interest at the moment, viz., what was actually being done to bring electricity within the reach of the people. The Sheffield Electricity Committee had supported the E.D.A. to the tune of £500 to start with, and he would have great pleasure in bringing the appeals that had been made to the notice of his Committee.

Alderman SENNINGTON (Bristol) said that the important thing to concentrate upon was the cheapness of electricity supply, because there had been cases in Bristol where people had gone back to gas on this account. In looking at figures of cost throughout the country, it was impossible not to be struck by the extraordinary variation both of costs and charges, and attention should be given to this.

Alderman (Mrs.) HAMMER (Hackney) asked the members to give all the support they could to the newly-formed Women's Electrical Association, because it was only by educating the women that the greatest development in the use of electricity could be looked for in the home. What was required was a central place where women could go for information and the Women's Electrical Association hoped to provide these facilities with the support of the industry.

Councillor THICKETT, in the course of a short reply, said he had not written the paper from any pessimistic point of view. The question was whether they had done all that could be done. Nobody could be satisfied with the position of the supply industry as it was to-day, because things could be very much better than they were, and the object of the paper was to stir up interest from that point of view.

(To be continued.)

Finnish Trade and Conditions.

The Development of Natural Resources.

ALTHOUGH Finland, on account of its small population, cannot be looked upon as a potential large consumer of British electrical goods, it possesses a certain significance from its proximity to Russia. It is probably in the light of this that a recent report by Mr. C. H. Mackie, the British Consul at Helsingfors,* should be read. This report reviews the economic, financial and industrial conditions of Finland. In some prefatory notes the population of the country is given as 3,400,000, of which 65 per cent. is engaged in agriculture, and only 15 per cent. in industry and manual labour.

Foreign Trade.

Great Britain is by far Finland's most important customer having taken 40.3 per cent. of her exports in 1924, Germany being second with 9.1 per cent. The positions are reversed in the case of imports; in 1924 Germany supplied 29.9 per cent., and Great Britain 18.8 per cent. The imports and exports for 1924 are fully analysed in an appendix to the report, and it is seen that electrical machinery weighing 1,141,936 kg. was imported during the year, the value being given as 21,729,650 Finnish marks (about £114,370). Insulated wires and cables are shown at 972 987 kg., valued at M 11,074,881 (£58,300); incandescent lamps at 82,455 kg., valued at M 13,583,442 (£71,500); steam machinery and turbines at 98,848 kg., valued at M 2,473,281 (£13,000); and water turbines at 364 kg., valued at M 6,800 (£36).

Copper Production.

A number of the older copper deposits in Finland are said to be extinct, but in 1909 a new important deposit of ore was discovered at Outokumpu, in East Finland, within easy reach of the sea. This deposit has a width of from 7 to 28 ft., and a length of about a mile, and it has been penetrated to a depth of 600 ft. It is estimated that about eight millions tons of ore (containing from 4 to 5 per cent. copper and 1.5 per cent. zinc) is available, but there is reason to believe that the deposit extends much deeper in which case the quantity may be much greater. The actual production of copper is at present estimated at 300,000 tons, worth about £20 millions at present prices, but double or treble that quantity may possibly be obtained. The State has acquired the Outokumpu Copper Works and provided working capital of M 3,458,000 for 1925. In the appendix referred to above, the exports of "Copper, unworked and scrap," are given as 195,611 kg., valued at M 1,637,965 (£8,620).

* Stationery Office. 2s. net.

Lead and zinc ores exist along the coast of the Arctic Ocean and in the southern part of Finland, but their economic value appears at present to be uncertain.

Hydro-Electric Development.

A scheme of reclamation of flooded land involving the regulation of the Vuoksi River, has been put in hand, and in this connection an important hydro-electric scheme is being carried out. This is the Imatra Rapids scheme, to which we have made reference from time to time. This scheme comprises a water area of about 60,500 sq. km., and embraces the large number of rivers and lakes that, pouring their waters into the great Saima Lake, issue forth as the Vuoksi River. The rapids on the first 27 km. of its course have a total fall of 64.24 metres, making the river very suitable for hydro-electric power production. A dam is in course of construction above the rapids in order to raise the water level there and attain a net head of 23 metres in the power plant, ultimately to be raised to 24 metres. The work of excavating the canal 500 metres long which will lead the water from above the dam to the power house, and the tail race of similar length linking up with the lower river is nearing completion. The site for the power house has been cleared and the building is in course of erection. It will accommodate three turbo-generators with an aggregate capacity of 80,000 h.p. A Swedish firm has secured the contract for the generators, while the turbines will be installed by a Finnish company. Tenders have been invited for sluice machinery and sub-station equipment. It is hoped to complete the first stage of the scheme by 1928.

General.

Finnish industry, in common with that of most other European countries, met many difficulties during 1924, the chief being stringent credit conditions and money shortage. The metallurgical industry appears to have suffered from the depressed state of the market, and electrical engineering works complained of keen foreign competition which compelled them to confine their attentions to the smaller classes of goods.

Mr. Mackie says that a ready sale can generally be found for all classes of British goods provided their prices are on a level with those of other countries' products. The British manufacturer is now more or less inclined to give as favourable payment terms as his competitors, but there is a general complaint that his prices are too high. The quality of British goods is never disputed, but their cost often appears to be beyond the means of the Finnish buyer. It is also stated that foreign suppliers have much better representation in the market than the British manufacturer.

Electrical Trade in Brazil.

The Scope for Domestic Appliances.

MR. P. W. COOK, Trade Commissioner of the Canadian Government at Rio de Janeiro, has recently reported on the Brazilian market for domestic electrical appliances. He considers that the country's position with regard to actual and potential hydro-electric development is most satisfactory, the comparatively small seasonal climatic change being favourable to steady output. Mr. Cook apparently regards the recent difficulties due to water shortage in Sao Paulo as exceptional, and unlikely to recur.

There is no doubt that hydro-electric development has been undertaken on a large scale and at a cost comparing favourably with all other South American countries. Yet owing to lack of social development the use of electrical domestic appliances is comparatively small at present. At the same time the national manufacture of electrical appliances has not as yet progressed far and consequently the market remains largely supplied by importation which in Mr. Cook's opinion, represents but a fraction of the potential market.

For the guidance of exporters the Trade Commissioner gives the voltages, &c., in the various cities. In Rio de Janeiro, Pernambuco, and Sao Paulo, a.c. at 50, 50, and 60 cycles respectively, at voltages of 120 and 220, is employed. Porto Alegre and Ceará have a 220/230 V, d.c. supply; while at Bello Horizonte and Juiz de Fora, 60-cycle a.c. at 220 V is in use.

The Trade Commissioner proceeds to describe the selling possibilities of a variety of electrical appliances. He says that electric irons have a steady market in all the larger cities. A 3-lb. iron sold c.i.f. at 8s. or 9s. would stand a fair chance. Toasters are used to an increasing extent, not only for domestic purposes but also by a number of the more important hotels.

There is a fairly good demand for grills, and it is apparently increasing. The price to the trade of a grill weighing 3 lb. is about 8s. or 9s. There is practically no market for electric stoves, nor are cooking ranges used to any appreciable extent.

For curling tongs there is a fairly steady demand, undoubtedly growing from year to year. The prospects for washing machines are poor, but cheap and efficient electric refrigerators would sell well.

As regards electric lighting sets, there is some demand in outh and Central Brazil, *i.e.*, the States of Rio Grande do Sul, Santa Catharina, Parana, and in the interior of Sao Paulo and Minas Geraes.

The Electrical Imports of Australia.

(Britain's Preponderating Share).

THE following figures showing the values of the imports of electrical goods into Australia in the fiscal year 1923-24 have been taken from the recently-issued official trade returns. The corresponding figures for the previous twelve months have been added for purposes of comparison and notes of increases or decreases given. We refer briefly to the electrical exports at the end of this article.

	1922-23. £	1923-24. £	Inc. or dec. £
Cable and wire, covered with cotton—			
Total	16,000	15,000	– 1,000
From United Kingdom ...	15,000	14,500	– 500
Telegraph and telephone cable, paper-insulated, lead-covered—			
Total, all from United Kingdom	15,000	14,500	– 500
Other telegraph and telephone cable—			
Total	953,000	996,000	+ 43,000
From United Kingdom ...	934,000	962,000	+ 28,000
,, Netherlands	4,000	9,000	+ 5,000
,, United States	13,000	22,000	+ 9,000
Carbon manufactures—			
Total	18,000	24,000	+ 6,000
From United Kingdom ...	11,000	12,000	+ 1,000
,, United States	4,000	9,000	+ 5,000
Dynamo-electric machines—			
Total	949,000	990,000	+ 41,000
From United Kingdom ...	645,000	613,000	– 32,000
,, Canada	6,000	7,000	+ 1,000
,, Germany	7,000	31,000	+ 24,000
,, Holland	2,000	7,000	+ 5,000
,, Sweden	35,000	31,000	– 4,000
,, United States	241,000	271,000	+ 30,000
Fans, electric—			
Total	41,000	41,000	—
From United Kingdom ...	16,000	15,000	– 1,000
,, Italy	7,000	8,500	+ 1,500
,, United States ...	17,000	15,000	– 2,000
Switches, fuses and lightning arresters—			
Total	216,000	253,000	+ 37,000
From United Kingdom ...	121,000	114,000	– 7,000
,, Japan	4,000	3,000	– 1,000
,, United States	87,000	132,000	+ 45,000
Heating and cooking appliances—			
Total	21,000	42,000	+ 21,000
From United Kingdom ...	9,000	11,000	+ 2,000
,, Canada	1,000	5,000	+ 4,000
Lamps, filament—			
Total	338,000	348,000	+ 10,000
From United Kingdom ...	173,000	165,000	– 8,000
,, Hungary	1,000	2,000	+ 1,000
,, Holland	123,000	128,000	+ 5,000
,, United States	36,000	44,000	+ 8,000
Measuring and recording instruments—			
Total	176,000	230,000	+ 54,000
From United Kingdom ...	119,000	146,000	+ 27,000
,, Switzerland	29,000	46,000	+ 17,000
,, United States	23,000	30,000	+ 7,000
Regulating and controlling apparatus—			
Total	528,000	219,000	–309,000
From United Kingdom ...	243,000	81,000	–162,000
,, United States	281,000	128,000	–153,000
Static transformers and induction coils—			
Total	146,000	124,000	– 22,000
From United Kingdom ...	64,000	83,000	+ 19,000
,, Sweden	1,000	5,000	+ 4,000
,, United States	80,000	32,000	– 48,000
Telegraph instruments and appliances—			
Total	51,000	28,000	+ 23,000
From United Kingdom ...	3,000	19,000	+ 16,000
,, United States	1,000	6,000	+ 5,000
Telephones—			
Total	196,000	237,000	+ 41,000
From United Kingdom ...	114,000	107,000	– 7,000
,, Canada	19,000	4,000	– 15,000
,, Sweden	2,000	6,000	+ 4,000
,, United States	59,000	115,000	+ 56,000
Telephone switchboards and appliances—			
Total	262,000	325,000	+ 63,000
From United Kingdom ...	97,000	170,000	+ 73,000
,, Belgium	5,500	7,700	+ 2,200
,, Sweden	3,000	12,000	+ 9,000
,, United States	155,000	134,000	– 21,000
Vacuum tubes—			
Total	7,700	33,000	+ 25,300
From United Kingdom ...	5,000	15,000	+ 10,000
,, Holland	—	3,000	+ 3,000
,, United States	2,000	12,000	+ 10,000
Electrical appliances, n.e.i.—			
Total	478,000	695,000	+217,000
From United Kingdom ...	255,000	333,000	+ 78,000
,, Canada	13,000	9,000	– 4,000
,, Denmark	8,000	6,000	– 2,000
,, Germany	3,000	6,500	+ 3,500
,, Japan	13,000	16,000	+ 3,000
,, United States	179,000	312,000	+133,000

Exports.

Australia carries on a small export trade in electrical goods of her own manufacture, but that in machinery is not expanding. Below are given the comparative values in 1923-24 and 1922-23.

	1922-23. £	1923-24. £	Inc. or dec. £
Electrical materials, other than machinery and appliances—			
Total	44,000	22,000	– 22,000
To New Zealand	42,500	20,000	– 22,500
Electrical machinery and appliances—			
Total	7,800	15,500	+ 7,700
To New Zealand	5,400	11,000	+ 5,600
,, Fiji	250	1,000	+ 750
,, New Guinea	360	800	+ 440

New Electrical Devices, Fittings, and Plant.

(Readers are invited to submit particulars of new or improved devices and apparatus.)

Extra-High-Pressure Potential Transformer.

In the accompanying illustration, fig. 1, is seen an e.h.p. potential transformer on test recently at the Rugby works of the BRITISH THOMSON-HOUSTON CO., LTD. It is designed for use on a 110,000-volt circuit, and occupies a floor area of 5 ft. 6 in., by 4 ft. 3 in. It measures 7 ft. 2 in. from the floor to the top of the tank, the overall height to the top of

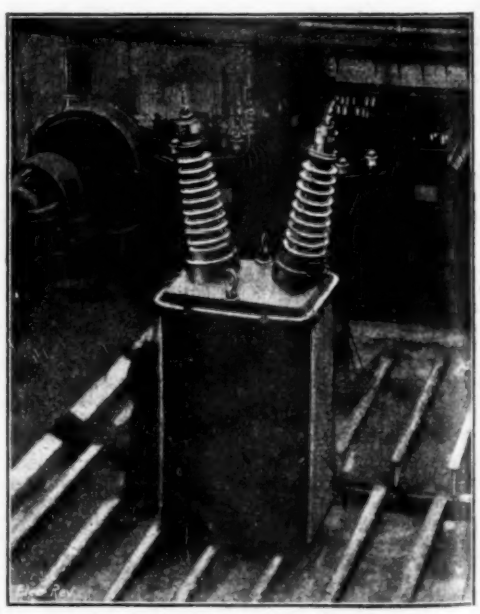


Fig. 1.—A 110,000-V Potential Transformer.

the bushings being 11 ft. 8 in. The transformer holds 600 gallons of oil, and when empty weighs 4,200 lb. It is interesting to note that four transformers, similar in design but for use on a 25-cycle, 74,000-volt circuit, are now in course of manufacture at the Rugby works, and will shortly be put on test. These transformers, as well as the 110,000-V unit illustrated, it is claimed, meet the requirements of B.S.S.81.

A Quick-acting Circuit Breaker.

According to *Electric Traction*, a new G.E. MR circuit breaker for railway service has been developed, having better circuit rupturing characteristics than previous designs, due to a powerful magnetic blow-out and the use of arc suppressor plates as used in drum controllers. The rupture is complete in a case of short circuit in approximately .03 second, about half the time required by the previous breakers.

The breakers are used for both protection against overloads and short circuits, and as hand-operated main switches. They

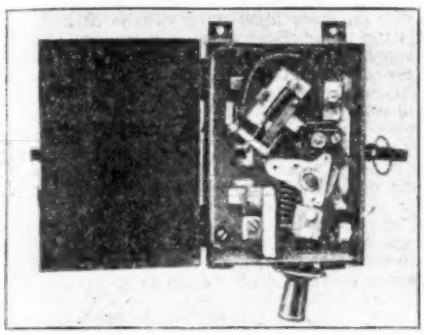


Fig. 2.—Quick-acting Circuit Breaker.

are light in weight and are enclosed in asbestos-lined sheet steel boxes.

A heavy compound base, held in the box by three cap screws, supports all the operating mechanism. Examination of the contact tips may be easily made by the removal of the arc chute, which is held in place by a single latch attached to the box in such a way that it can be moved only when the cover is open. All parts of the breaker are readily accessible for repairs or inspection. A view of the breaker is shown in fig. 2.

A New Tinning and Soldering Compound.

A patent compound called "Soldo," which automatically cleans as well as tins any metal except aluminium, has been brought to our notice by the SOLDO CO., of Sicilian House, Southampton Row, London, W.C.1. It is a greyish-white powder consisting of particles of pure tin mingled with a crystallised salt, slightly hygroscopic and is put up in moisture-proof tin boxes. We have tried this compound on a rusty iron wire and a No. 24 s.w.g. galvanised iron wire, without cleaning them in any way; heated in a gas flame, dipped in the compound (of which a small quantity adhered to them) and again heated and placed in contact, they were soldered together so effectively that when stretched the wire broke outside the joint. The makers claim that the compound is free from acid, and the tinning is permanent; moreover, interpenetration of the metals occurs to a greater extent than in the case of ordinary solder. In support of these claims they

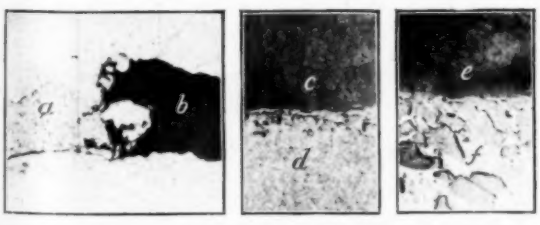


Fig. 3.—Rusty Steel and Manganese Bronze Sections.

have had tests made at the National Physical Laboratory, whose report states that phosphor-bronze, "Ohmal" strip, manganese-bronze, steel, and cast-iron were all tinned with one application of "Soldo." Rusty steel and rusty cast-iron were also tinned with two or three applications of the compound, assisted by rubbing with a soldering iron. Comparative tests with workshop methods of tinning were made by microscopic examination of sections to ascertain the degree of interpenetration, which was found to be, in the case of phosphor-bronze, about twice as great with "Soldo" as with the ordinary method. "Ohmal" is usually hard-soldered on account of the difficulty of tinning it with soft solder, but was successfully tinned with the compound. In the case of manganese bronze the interpenetration was four or five times as great, and the sections of very rusty steel and cast-iron showed that the rust had been effectively removed wherever "Soldo" was applied, and interpenetration had been obtained "illustrating in a marked manner the cleansing properties of the compound." Fig. 3 shows a section of rusty steel (×200) tinned with "Soldo" at *a*, rusty and untinned at *b*; and sections of manganese bronze (×350) at *c* and *e*, tinned in the ordinary way at *d*, and with "Soldo" at *f*, the greater depth of the copper-tin alloy being apparent in the latter case. For tinning the soldering bit we have found "Soldo" most effective, and with the bit so tinned a small joint can be soldered without further application of soldering flux.

An Electric Melting Pot.

Some particulars are given in *The Electrical News, Toronto*, of an electric melting pot which has recently been developed by HAROLD E. TRENT. The heating element is of nickel-chromium wire embedded in heat conducting electrically insulating refractory which, it is stated, is assembled under hydraulic pressure and secured to the bottom of the retort. It is claimed that this construction permits a temperature of 1,200 deg. F. to be reached. The heat insulation is a special cement for which high efficiency is claimed. A three-heat switch at the end of four feet of flat armoured cable protects the leads and facilitates installation.

The capacity of the pot is 30 to 35 lb. It is 10 in. in diameter and 8 in. high, and it weighs 36 lb. It is stated that 1,000 deg. F. may be obtained in 65 min., and 500 deg. F. in 35 min. The current rating is 1,200 W normal. It is especially adapted for melting tin, lead, zinc, babbit, solder, and type and needle metal.

Fig. 4.—The "Touchtone" Horn.

A New Electric Horn.

Fig. 4 illustrates the Tangent "Touchtone" electric horn, an industrial hooter which is being marketed by MESSRS. GENT AND CO., LTD., Faraday Works, Leicester. The horn can be supplied to operate on either a.c. or d.c. systems at any pressure up to 250 V, or on 6 V or 12 V batteries. The mechanism is encased in a hermetically sealed cast-metal case and is claimed to be flameproof, fireproof and water-tight. The electrical parts are well insulated and leading-in glands are provided for sealing the cable openings after insertion of the cables. No delicate or micrometer adjustments are necessary and it is claimed that permanent adjustment can be effected with an ordinary screw-driver.

An Electric-Light Bath.

THE HIGHBURY ELECTRICAL APPLIANCE CO., 57, Compton Road, Highbury, N.1, is about to put the portable radiant apparatus which we illustrate herewith, on the market. When open the appliance takes the form of a three-sided appliance which is intended to be inverted over the limb or part of the body requiring treatment. It is claimed to be perfectly rigid when

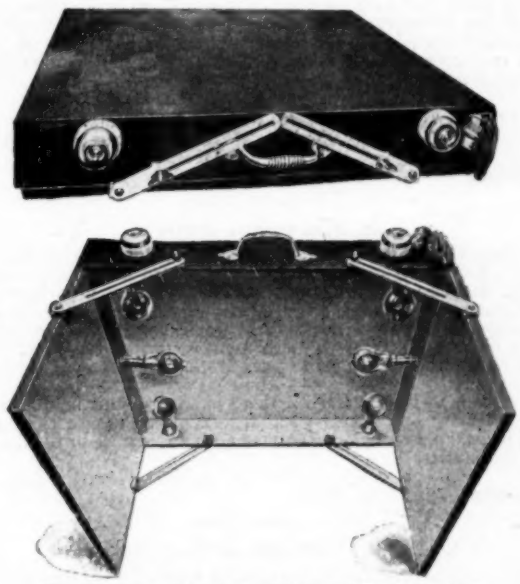


Fig. 5.—Electric-Light Bath, Folded, and Ready for Use.

in use, but is rendered portable when folded in a small compass similar in form to an ordinary suit-case. The apparatus is lined with sheet tin and is wired for six lamps with a consumption of about 800 W. The device is made in two styles, one with a mahogany case and the other of a lighter make in plywood for the use of the visiting practitioner.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Power Factor.

As a reader of some years' standing of your paper, I think the article by "Stan Dard" in your issue of June 19th on "This Puzzling Power Factor" does not make for electrical progress. Why did "Stan Dard," if he desired his article to be a progressive one, not finish his subject with some of the simpler methods of ascertaining the power factor in electrical circuits? As one of your non-technical readers I should have enjoyed "Stan Dard's" article much better if it had been finished in that manner.

James L. Shiels.

Lenzie, *June 29th*, 1925.

[The article referred to dealt with the lighter aspect of the subject, and did not profess to discuss it from the technical point of view, for which we may refer our correspondent to the little book on "Power Factor Correction," by Mr. A. E. Clayton (Pitman's, price 2s. 6d. net).—EDS. ELEC. REV.]

Artificial Crop Drying.

In your issue of the 26th ultimo Mr. Borlase Matthews offers some remarks on an article published by you on the 12th ultimo on "Electricity in Agriculture." Referring to the hot-air process for drying crops, he observes that this has not proved itself in practice for ricks of over 25 tons. It may not yet have done so, but the maximum dried has been eighteen tons of finished material. But the implication that all practical farmers incline to stacks of this size is scarcely justifiable. Stacks vary in size in different parts of the country. Stacks of 10 to 14 tons (finished material) are quite as common in some parts as the larger stacks in others. It is also suggested that the hot-air process bases all its claims on one of two 8-ton stacks dried last year. Those two were experimental stacks—they were not demonstrations. Much was learnt from them and put into practice last year with the greatest success—some 250 tons of wet corn being dried in an average time of under an hour per ton. The method is being proved in a practical way by numerous demonstrations conducted by the Ministry of Agriculture, and practical farmers express no doubt as to the excellent quality of the hay produced. It is certainly better than that produced in the experiments conducted with cold air in 1923 by the Ministry of Agriculture, and it is more than doubtful whether the hot-air process is dearer, as Mr. Matthews seems to assume. It is certainly not so tedious, nor does it require the same care and attention as the cold-air method. It is quite true, as Mr. Matthews states, that no comparative feeding trials of the two artificial systems—hot air and cold air—have been made. Nor are they likely to be. Nor have there yet been any conclusive detailed feeding trials of either in comparison with ordinary hay. So far, however, as tests have gone, there is no doubt that in palatability the hot-air hay surpasses the best natural hay, and trials on milk yield show that milk production is considerably increased by replacing ordinary with hot-air hay, weight for weight. Chemical analysis has shown that fermented hay produced by the cold-air process is inferior in every respect to ordinarily weathered hay.

B. J. Owen, M.A., D.Sc.,
Director of the Institute of Agricultural Eng.
Consulting Engineer of the Ministry of Agriculture and Fisheries.

Oxford, *June 29th*, 1925.

Is there an Age Limit?

I have been engaged in electrical engineering for thirty-three years, for twenty-five of which I have acted as assistant and chief engineer of contracting and maintenance departments for municipal and engineering firms. Owing to the closing of a similar department with my last employers, I have been out of a definite berth for eighteen months, during six of which I have advertised, and made persistent applications with negative results.

I should be glad to learn if there is an age limit in this era for obtaining employment; perhaps some readers of a pioneering journal such as yours can give their experience or opinions on the matter.

L. P. Ives (Non-Union).

London, *June 30th*, 1925.

Cooking by Electricity the Ideal Method.

Herewith is an extract from a letter received from a prospective consumer:—

"Your surveyor can confirm that there is absolutely no provision in this house for cooking except with a gas cooker . . . the lack of cooking facilities is simply intolerable."

This seems to be a great tribute to electric cooking, that gas is simply intolerable.

K. A. T.

July 4th, 1925.

Installation Practice.

Your correspondent "Essex" is up against the old trouble of "Mr. Plumber" carrying out electrical installations, and while I am in full sympathy with your correspondent, I am afraid there is no redress. Some time ago the ELECTRICAL REVIEW published a report from the *Melbourne Age*, wherein a plumber was fined for interfering with matters electrical. This, of course, happened in Australia, but in Britain it seems that anybody can do an electrician's work with impunity.

"Essex" states that a decorator and plumber (a strange combination) is carrying out electrical work and is being assisted in it by the burgh electrical engineer. If that is the case, the engineer must be a strange sort of individual, or perhaps the plumber-decorator is a relation of the former. I would suggest to "Essex," first, to ascertain definitely if the engineer in question is aware that the work is being carried out by someone other than a *bona-fide* electrical contractor. On making sure of his ground "Essex" could then report the electrical engineer to the proper quarters. If "Essex's" statement is correct it will be the first time I have heard of a burgh electrical engineer giving technical advice to a plumber. Most of the gentlemen that I have met are above that sort of thing.

A word of consolation to "Essex": the client who has employed the plumber to carry out his work will probably have to pay "through the nose," and also he will be obliged to call in a *bona-fide* contractor at the finish to do the work over again.

Contractor No. 2.

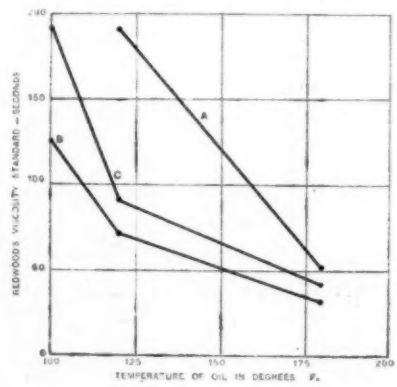
June 27th, 1925.

Lubricating Oil for Turbines.

The question of the best class of lubricating oil for steam turbines is most often left to the decision of the turbine makers; this is the wisdom of safety, at the same time acknowledging the lack of sufficient knowledge to specify what oil is suitable, and the physical conditions of the tests that should be conformed to.

Most turbines are provided with rotary displacement oil pumps; therefore, each revolution implies the same cubic capacity of oil being circulated; an ideal pump would be one that increased the amount of oil per revolution, depending upon its temperature. But as this is not at present attainable it behoves the operating engineers to obtain an oil having as flat a viscosity grade to temperature rise as possible.

Usually makers specify the viscosity in seconds at one temperature, generally 100 deg. F. This tells the operating engineer nothing. At least three readings should be required, corresponding to different temperatures; the flattest curves will usually indicate the best class of oil for the purpose.



I enclose the readings recently taken by myself for three oils, all guaranteed to be high-class turbine oils. I am not drawing the connecting lines as curves, which, of course, should be done but the straight lines show up the incongruity of the makers' statements.

The matter is of such importance to power station staffs that you will no doubt publish this letter, and it will, I hope, be the means of helping all round.

J. E. Stewart.

Swansea, *July 2nd*, 1925.

A British Institute of Radio Engineers.

I was very pleased to see Mr. Stanley's letter on this subject in your "Correspondence" columns of this week's issue.

In the first place, I would like to make quite clear the sense in which I have used the term "advanced *amateurs*." An "*amateur*" is one who does not engage in a pastime for personal gain, whereas a "professional" is one who relies upon his work wholly or partly as a means of livelihood. It will be seen that an amateur may be more skilled and even better trained technically than his professional brother. I cannot agree with Mr. Stanley's statement that the Wireless Section of the I.E.E. covers all the ground necessary; I only wish it were so.

If one will peruse a summary of all the papers read and discussed at the I.E.E. headquarters *and* local centres it will be seen that wireless forms a very small proportion of the subject matter.

My whole contention is that for the radio man this position should be exactly reversed, *i.e.*, he requires, say, 90 per cent. of the papers, &c., to be on radio matters and the balance on kindred electrical subjects. I think Mr. Stanley will appreciate this point if he will realise that radio matters are quickly becoming so important that they cannot simply be attached as a side line to general electrical engineering. These are not only my views, but are amply borne out in the correspondence Mr. Evans and myself are receiving daily.

If I may, I would like to amplify one statement in my original letter. I have actually discussed the matter with advanced amateurs *and professionals*.

If any further argument is necessary as to the usefulness of the above Society, I would ask why so many British radio engineers have joined the American Institute of Radio Engineers; surely if all these members had felt that the I.E.E. covered the ground they wanted, they would not have joined a society which, although it publishes excellent proceedings, does not hold any meetings or discussions in this country.

I am afraid also that the amateur societies in this country do not fill the bill; a technical society must not in any way be political or be concerned with such matters as broadcast programmes, &c. Please do not let there be any misunderstanding—the amateur societies have done and will do in the future good work and it is not intended that this new society should encroach on their province. Also it would be an ideal condition if it were possible for the I.E.E. to take into its Wireless Section a number of workers at present barred. It would be well to bear in mind that a number of eminent scientists have, during their career, passed through what I have already called the advanced amateur stage. Please do let us avoid any "dog in the manger" policy; surely if the Americans can run a successful Institue of Radio Engineers as well as the American Institute of Electrical Engineers, we Britishers can do the same. It is a great pity that we were not the pioneers in the matter.

In conclusion, I would say that I have been in correspondence with a prominent member of the I.E.E. in London on this subject, and have also called at headquarters, it being our wish to act with the approval of the Council of this body. However, at the moment the matter in this direction must be considered *sub rosa*.

J. Nelson.

Prescot, *July 4th*, 1925.

A Neglected Instrument of Precision.

I read with much interest the article entitled as above, which you published in your last issue. It is somewhat out of the usual run, and so, being different, attracts attention. The subject is one to which I have often given consideration and frequently tried to put into practice. It is, however, difficult amidst the pressure of ordinary work to find time to make some record of that work in writing—though I agree that it should be done, even if it means the burning of midnight oil. I have found that the very fact that records are put in writing facilitates one's work, for friends read it and discuss it, with the result that ideas are developed that facilitate further work and progress. Again, writing about a subject compels one to make sure that all the salient points are noted. To inspect a new machine and then to go away is one thing, but it is a very different thing if a description has to be prepared, for in the latter case the observation necessarily has to be more careful—thus one learns more as the result of writing. I have done a fair amount of writing, but still find it a difficult task to express matters clearly and logically in an interesting manner, though I feel that I am gradually improving. I always endeavour to get others to record their experiences for their own benefit and that of others.

As your contributor, Mr. Monaghan, says: "An engineering problem is not completely solved until the solution is available for the world at large." To-day that must be largely done through the written word.

R. Borlase Matthews.

East Grinstead, *July 4th*, 1925.

The Training of Power Supply Engineers.

I was very interested in the article of Mr. Bromley which appeared in your issue of June 12th but holidays have prevented me from commenting upon it earlier.

With some of the things he has said I am quite in agreement, but he has not succeeded in convincing me, nor do I think he will have succeeded with other engineers, that a two years' course in a manufacturing workshop is unnecessary. If there was one feature more than another in the E.P.E.A. Report on the Training of Engineers, which met with the most general approval amongst engineers throughout the country, it was the proposal that the trainee should spend at least two years in a manufacturing works before entering an electricity undertaking, as the latter was not the best place in which to acquire a good mechanical training.

Everyone will agree, of course, that a power-station engineer need not be an expert fitter, but he ought to know the best way in which to go about a job. Mr. Bromley admits this, but he is mistaken if he supposes that an engineer will possess this ability after having had only about twelve months on repair and construction work in a power station.

In the first place, the experience gained during this short period will be much too limited, and may even be confined to the carrying-out of minor repairs, whereas a longer period in a manufacturing works will enable the trainee to know something of the actual construction of an engine, turbine, or other piece of machinery, from start to finish. Also his attitude towards the carrying-out of an engineering job is likely to be much better if he acquires his mechanical experience in a works rather than in a station. In the latter a repair job must necessarily, in nine cases out of ten, be carried out as speedily as possible and those circumstances are not such as are calculated to develop thoroughness and accuracy.

Furthermore, if my own experience is anything to go by, I should say that many power stations are not equipped with the most up-to-date workshop machinery as are manufacturing works, so the trainee cannot hope to get the same acquaintance with modern methods in the former as he can in the latter. Expert mechanics are not always available in power stations, and even if they are, every experienced engineer knows that occasions frequently arise when he himself has to decide on the best way of carrying out a difficult repair job, and it is then that a good mechanical experience stands him in good stead.

With regard to his criticism that the training outlined by the E.P.E.A. is too protracted, I am unable to see that there is much in it. Under the scheme which he has outlined it is expected that the student shall have had a technical college training and preferably shall have taken a degree. This will mean a period of three years, and together with the time spent in an electricity undertaking will amount to a total of six years. Under the draft scheme of the National Joint Board the total may be six or seven years, according to circumstances.

With his remarks relative to the pecuniary disadvantages under which the engineering student labours as compared with the young medical or dental student, I am in entire agreement. The only remedy for this, however, is for electricity undertakings to shoulder some of the responsibility and thus provide sufficient inducement to youths entering upon the course marked out.

J. W. Thomas.

Manchester, *June 29th*, 1925.

Celluloid in Accumulators.

May I, through you, ask your anonymous correspondent whether he has made a great discovery, or whether he has only just heard of the material, commonly called "non-inflammable celluloid" which, as is very well known, has been on the market for many years?

If the latter is the case, your correspondent may like to know that as soon as this material was available, attempts were naturally made to use it for manufacturing cell cases.

It was, however, very quickly discovered that the material simply shrivelled up under the action of sulphuric acid, and was, therefore, quite useless for cell cases. It so happens that some years ago I demonstrated this fact to the Mines Department, and I still have the cell case—or rather the remains of it—with which I demonstrated.

I am more particularly interested in the cells of miners' lamps, and for some years I have developed and used ebonite cell cases as an alternative to celluloid—the choice being entirely with the purchaser.

It must be admitted, and has been admitted, that whilst the ebonite case has the advantage of being non-inflammable and easily handled it will not stand the same amount of ill-usage as celluloid, and is opaque.

I am sure that a number of your readers, including myself, will be most anxious to know whether your correspondent has now discovered a "non-inflammable celluloid," which will withstand the action of sulphuric acid.

Theodore Stretton.

Cardiff, *June 30th*, 1925.

The Electrocution of Rats.

As you have not published any reply to the letter on the above subject in your issue of June 19th, perhaps what I have attempted in this connection may be of interest.

I constructed a trap consisting of a baseboard of wood carrying on its face an annular metal ring 3 in. in width and about 9 in. in diameter on the centre line, with a concentric hole in the centre cut through the base board about 3 in. in diameter. Below this was fixed a metal dish containing the bait, consisting of pieces of cheese, apple rind, and drops of oil all floating in water. The leads from a 220-V single-phase alternating circuit were soldered to the ring and the dish. I calculated that the hind legs of the rat would be on the ring and his front paws, holding to the edge of the hole in the wood, insulated, so that he would get a current through the mouth right through the brain and body to the hind legs.

From the subsequent appearance of the straw I put down to camouflage the trap, I fancy the rat got the surprise of his life, but that was all, and I stopped up his hole whilst I proceeded to investigate the more remunerative business of the extermination of "rates" suggested by your printers' "devil" in the letter referred to.

R. K. Hearn.

June 29th, 1925.

Street Lighting in Bradford.

I desire to correct a misstatement in the report of my remarks in the discussion on street lighting at the Brighton I.M.E.A. Convention.

I am reported as saying that in Bradford we had appointed a lighting expert to advise a new Committee selected from the Watch and Finance Committees. What I said was :—

"The Chairman of the Electricity Committee and myself had suggested a scheme for complete lighting, and as it was too large an undertaking to do at once, it was suggested to take part in hand, taking the most important part one year, and afterwards to work from a centre until all was completed."

The misquotation I desire mainly to draw attention to is that the Committee is being advised by an independent expert.

As the matter at present stands, we in Bradford are awaiting reports from both the Gas and the Electricity Departments before the scheme is considered, so that it will be quite clear that I could not make the statement attributed to me, but what I did say was :—

"In my opinion the proper Committee to deal with street lighting was a Committee selected from the Watch and Finance Committees, so that the cost would be watched and also the Watch Committee as controlling the Police Force would be in the position through having their men in all streets of being at all times able to report as to the efficiency of the street lighting."

I was also very careful to state at the conclusion of my remarks my own personal opinion :—

"I feel very strongly that the time has come when there should be appointed in all towns of any reasonable size and which will warrant it a lighting superintendent, who shall be responsible and shall be in a neutral position between gas and electricity and who shall advise the Committee responsible for lighting as to the methods to be adopted. I am quite satisfied that not only would this make for better results from the lighting side, but also for economy, and it would remove any feeling between the two departments."

I must apologise for the length of this letter, but feel that under the conditions at present obtaining in Bradford as to the lighting of streets the correction should be made.

J. W. Longley.

Bradford, *June 30th*, 1925.

The London County Council Tramways.

Report for 1924-25.

AT the meeting of the London County Council on July 7th, the Highways Committee presented its report on the working of the tramways for the year ended March 31st last.

This shows that the total income for the year was £4,229,837, as compared with £4,374,057 in 1923-24, while the working expenses rose from £3,518,362 to £3,754,140. There was accordingly a surplus of £475,697 (£855,695), but against this the cost of renewals amounting to £282,382 (£310,241) was charged, reducing it to £193,315, as compared with £545,454 in the preceding year. Owing to the temporary suspension of certain sinking fund payments the capital charges were considerably reduced, the amount charged against the surplus being £471,756, as against £705,676. In spite of this, however, the net deficit for the year was £278,441, as compared with £160,220 in 1923-24. This deficiency has been met to the extent of £40,604 out of the balance of the reserve fund formed from the surplus of £200,827 which accrued in 1922-23; the remainder has to be met by a special county rate.

The total net capital expenditure upon the undertaking amounted at March 31st last to £16,692,535, of which £436,721 represented expenditure during the past year. The amount of debt incurred up to March 31st was £17,025,583; the net debt outstanding, after allowing for repayments, sinking fund balances, &c., was £9,099,538. It is worthy of note that the amount of capital expenditure which had become obsolete owing to the electrification of horse tramways was £2,024,688, but this had been reduced to £751,215 by March 31st last.

The sum paid to metropolitan borough councils and the City Corporation for rates on the permanent way amounted last year to £59,933, in addition to £77,609 paid in respect of offices, car sheds, sub-stations, &c. The saving to the road authorities in consequence of the obligation of the Council to maintain the paving along the tramway routes was estimated at the end of the year under review to be about £240,000 a year on the present mileage. Debt charges in respect of street widenings amounted to £30,906. These three items, *i.e.*, rates on track, road maintenance, and street improvement charges, together amounted to £330,839, and various local rates were therefore relieved to this extent.

The traffic figures show that the inclusive length of track was 164.14 miles; the car-miles run during the past year totalled 68,068,216, as against 64,118,565; the number of passengers carried fell from 689,015,086 to 682,595,733; the average receipts per car-mile declined from 16.04d. to 14.63d.; and the average working expenses per car-mile rose from 13.17d. to 13.24d.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

3,374. "Receiving and transmitting aerials for wireless telegraphy and telephony." J. Piebanski. February 8th, 1923. (211,151.)

3,472. "Cathode-ray oscillographs." E. V. Appleton, J. F. Herd, and R. A. W. Watt. February 11th, 1924. (235,254.)

3,678. "Electric motor control systems." A. H. Jackson. February 12th, 1924. (235,258.)

3,880. "Electric switches." A. Page. February 14th, 1924. (235,260.)

5,462. "Direct-current electricity meters." S. Z. De Ferranti and Ferranti, Ltd. March 3rd, 1924. (235,267.)

5,604. "Electro-deposition of metals." T. W. S. Hutchins. March 4th, 1924. (Addition to 197,666.) (235,272.)

5,673. "Magneto-electric machines." R. B. North and A. Massey-Allen. March 5th, 1924. (235,274.)

5,719. "Receivers for electrical transmission, particularly wireless transmission." W. H. Fulford. March 6th, 1924. (235,275.)

5,863. "High-frequency telephony or telegraphy." Electrical improvements, Ltd., Newcastle-upon-Tyne Electric Supply Co., Ltd., and L. C. Grant. March 7th, 1924. (235,278.)

5,882. "Variable electric condensers and like rotary instruments." C. C. Phillips. March 7th, 1924. (235,279.)

6,025. "Systems of charging and discharging storage batteries." A. D. Riccia. March 8th, 1924. (Patent of addition not granted.) (235,282.)

6,032. "Sound-recording, transmitting, receiving, and reproducing devices." F. C. Townshend and V. J. P. Clifford. March 8th, 1924. (235,283.)

6,148. "Inductance coils, transformers, and like wireless accessories." H. C. Weston. March 10th, 1924. (235,292.)

6,155. "Thermionic valves." H. J. Round. March 10th, 1924. (235,293.)

6,170. "Inductance coils and the method of producing the same." J. G. Snowball. March 11th, 1924. (Cognate application, 10,549/24.) (235,296.)

6,214. "Electromagnetic apparatus, specially suitable for use as a relay, switch, motor, or like device." Creed & Co., Ltd., and F. G. Creed. March 11th, 1924. (235,300.)

6,370. "Electric inductance coils." Major & Co., Ltd., and W. A. M. Valon. March 12th, 1924. (235,303.)

6,409. "Circuits of thermionic amplifiers." Burndept, Ltd., and C. F. Phillips. March 12th, 1924. (235,307.)

6,423. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. August 25th, 1923. (220,923.)

6,476. "Electric brake and solenoid-type magnets." Crompton & Co., Ltd., and W. F. Jones. March 13th, 1924. (235,310.)

6,477. "Electromagnetic switches for rheostats and regulating gear." Crompton & Co., Ltd., and W. F. Jones. March 13th, 1924. (235,311.)

6,520. "Coupling of detecting and aerial circuits in wireless receiving apparatus." K. D. Rogers and G. V. Dowding. March 13th, 1924. (235,312.)

6,645. "An interlocking arrangement for two or more devices applicable, for instance, to electric switchgear." British Thomson-Houston Co., Ltd., and C. W. Wood. March 14th, 1924. (235,319.)

7,499. "Portable wireless headphone cabinet." J. H. Christian. March 24th, 1924. (Cognate appplication, 24,999/24.) (235,327.)

8,064. "Detectors for wireless telephony." A. G. J. F. Clutterbuck and F. A. Soden. March 31st, 1924. (235,332.)

10,552. "Electrical methods of igniting in internal-combustion engines." H. P. T. Lefroy. April 29th, 1924. (235,351.)

11,097. "Electric converting apparatus." J. E. Calverley and W. E. Highfield. May 5th, 1924. (235,361.)

12,087. "Telephone systems." Western Electric Co., Ltd. July 31st, 1923. (219,942.)

12,522. "Electrical signalling systems or annunciators, chiefly for hotels." International Electric Co., Ltd., and F. R. Baldock. May 21st, 1924. (235,368.)

12,894. "Electric hot-plate or boiling-ring." H. Aumann. May 26th, 1924. (235,374.)

13,415. "Connection of electric conductors." J. Lucas, Ltd., and O. Lucas. May 31st, 1924. (235,378.)

13,698. "Impulse-sending devices of the dial type." Automatic Telephone Manufacturing Co., Ltd. December 10th, 1923. (226,152.)

14,467. "Apparatus for applying electrical currents to the body." M. Smart. June 14th, 1924. (235,388.)

14,666. "Device for measuring the voltage, load, and work on the high-voltage side of high-tension plants." Sachsenwerk Licht-Und-Kraft Akt.-Ges. November 30th, 1923. (225,508.)

16,299. "Wireless aerials." J. H. Herzog. July 7th, 1924. (235,407.)

17,328. "Electrically-heated hand-irons." D. Donaldson. July 19th, 1924. (235,412.)

18,434. "Method of, and means for controlling and distributing electric current." British Thomson-Houston Co., Ltd. (General Electric Co.). August 1st, 1924. (235,417.)

22,130. "Electric inductance coils for locating metals which are being carried away." R. H. Geffcken, R. H. Richter, and Geb. Wetzel. November 26th, 1923. (225,517.)

23,939. "Electric measuring instruments." British Thomson-Houston Co., Ltd. October 9th, 1923. (223,240.)

24,011. "Electrical switches." H. B. Old. October 10th, 1924. (235,442.)

25,562. "Electrical condensers for ignition circuits." Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). October 27th, 1924. (235,448.)

26,807. "Delay-action overload relay devices for high-tension electric circuits." H. M. Smitt. November 16th, 1923. (224,888.)

27,606. "Loud-speakers for radio receiving apparatus and the like instruments." Edison Swan Electric Co., Ltd., and W. J. Davis. November 18th, 1924. (235,465.)

27,787. "Electrodes for use in electrolytic systems for protecting boilers or the like." A. Kirkaldy. November 20th, 1923. (225,222.)

29,124. "Method of reducing disturbing currents induced in signalling lines by neighbouring power lines." International General Electric Co., Inc. December 4th, 1923. (225,861.)

29,326. "Telephone receivers." Westinghouse Electric and Manufacturing Co. December 7th, 1923. (225,874.)

30,121. "Electrical apparatus." British Thomson-Houston Co., Ltd. December 15th, 1923. (226,237.)

30,157. "Electric fuse and like fittings." W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze. December 15th, 1924. (Addition to 217,010.) (235,476.)

30,453. "Reinforced-concrete sleepers for the permanent-way of railways and tramways." V. Isern Y. Dominguez and F. P. De Los Cobos Y Cerda. December 18th, 1924. (235,478.)

1925.

321. "Frame aerials for wireless telegraphy and telephony." K. Burk. January 23rd, 1924. (228,135.)

704. "Overhead lamps." Dr. K. Markau. January 9th, 1924. (227,461.)

1,612. "Vacuum-tube oscillation generators." Westinghouse Electric and Manufacturing Co. January 25th, 1924. (228,160.)

1,720. "Electrically-heated annealing furnaces." Akt.-Ges. Brown, Boveri et Cie. August 13th, 1924. (235,490.)

6,523. "Alternating electric-current relays and circuit arrangements therefor for protective purposes." International General Electric Co., Inc. March 10th, 1924. (230,501.)

6,669. "Electrolytic production of aluminium." Aluminium Co. of America. April 10th, 1924. (232,189.)